The
Electrical Review

VOL. CX. MARCH 11, 1932. No. 2833.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Modern Steam Generators

THREE main lines in the progress of steam generation are in the direction of increasing (1) the reliability of the boiler-house plant, (2) the ability of the boilers to utilise coal containing the greatest number of heat units for a given cost, while operating near the theoretical minimum supply of air, and (3) the output obtainable from a given floor area.

We place reliability first, not only on account of the elementary principle that the supply must be maintained, or even of the desirability of low maintenance costs, but also because with improved reliability the number of boilers required for each turbine could be materially reduced; the capital charges saved by installing larger and more efficient units would represent a real economy.

The average numerical ratio of boilers to turbines is now three to one, one of the boilers being regarded as a spare. The limitations on boiler capacity once imposed by difficulties in the construction of large mechanical stokers no longer hold good for any sizes suitable for British conditions, while with pulverised fuel there need be no limit on constructional grounds.

If the reliability of the boilers was equal to that of the turbines, which in some undertakings run for 9,000 hours between overhaul and need very few minor repairs in the interim, there is no reason why one boiler (fired with pulverised fuel, at any rate in the larger sizes) should not feed one turbine.

In his admirable paper on "Modern Boiler Plant" read before the I.E.E. last night, Mr. Bruce mentioned that in America in some cases dumping bars had been dispensed with. It is in details of this kind that reliability can be made most certain, as small adjustments are the bane of the boiler-house engineer.

The pressure parts give little trouble, the water-cooling of furnace walls has revolutionised the position with regard to the combustion chamber, and we need not doubt that superheaters will soon cease to be a major cause of failure.

Under the heading of reliability we should place the need for a high degree of operating skill, in spite of some degree of automatic working. Indeed, nothing differentiates the new type of power station from the old more than the greater importance now attached to technical and supervisory ability in the boiler house.

The use of low-grade coal has been very greatly stimulated by the adoption of pulverised-fuel firing, but there still remain problems for solution in methods of dealing with coal of low volatility or having ash with a low fusion point or of an abrasive character.

The remarkable increase in output in relation to floor space during the past few years was clearly brought out by Mr. Nicholls in our issue of February 12th. This is largely owing to the increased use of radiant heating, and follows Stefan's law that the amount of heat transferred varies as the difference between the fourth powers of the temperatures of the hot and cold bodies; this implies the need to strive after maximum furnace temperatures.

The examples of high thermal efficiencies quoted by Mr. Bruce from American operating data—many are in the neighbourhood of 25 per cent. on kWh generated—show the effect of large distribution areas and high plant load factors. They are relevant to British conditions as presenting a forecast of what is likely to be a common condition here within the next few years, having regard to the lines of development which we have outlined.

Progress in the Midland Counties

IN the course of his speech as Chairman of the Midland Counties Electric Supply Company, Ltd., Mr. George Balfour, M.P., showed that, notwithstanding general industrial depression during last year, there was such an expansion of business that the new connections more than overtook any drop in industrial demand. Large power consumers afford a very desirable class of business when the wheels of industry are running freely but figures given by Mr. Balfour show that when the brake is put on, and big consumers reduce factory, mine, or other like operations, or, worse still, actually close down, the

larger undertaking has anxieties from which many a smaller system is free. For instance, two customers (one an industrial consumer) together showed a drop of 14,000,000 kWh, and there was a general falling-off due to trade depression. Yet the company was more than recompensed by the growth of the general demand consequent upon the enrolling of 8,600 new customers of the smaller class (domestic, ordinary power, and two local authorities), producing a better revenue per unit. The policy of "forcing development," in spite of hampering legislative and industrial conditions, is considered to have been amply justified by results. The future seems to be very promising. One of the big temporarily-lost industrial consumers has already come on again, and is taking a larger load than in 1930. There are now 41,800 consumers, and this number will constantly grow. Mr. A. R. Holland said that there are already signs of trade progress due to the new tariff policy of the country. Mr. George Verity spoke to similar effect on Wednesday at the meeting of the Metropolitan Electric Supply Co., which expects to add considerably to its power load through tariffs promoting the interests of small manufacturers.

The Laggards

SINCE publishing the article entitled "An Electrical Engineer's House," in our issue of February 26th, we have heard from electrical contractors who inform us that they have the requisite experience to install and guarantee electric hot-water systems. We do not doubt it. If officials of supply undertakings do not feel themselves competent to advise consumers on the subject, they might at least keep a record of contractors who can do so. Mr. Pybus, speaking at Birmingham, left little doubt in the minds of his listeners that undertakings which persist in taking a narrow view of their obligations would be relieved of their responsibilities in the near future. While Mr. Lamb was quite justified in pointing to the progressive spirit shown in towns like Manchester and Birmingham, there are, unfortunately, many supply authorities who have not realised that failure to readjust their outlook to meet modern conditions must result in their being merged in some such central organisation as that foreshadowed by Mr. Nichols Moore at the last I.M.E.A. Convention.

A Golden Opportunity

IT seems quite reasonable to expect a more general co-operation between electrical undertakings and contractors, architects and builders than has hitherto existed. Indeed, we may say that the establishment of a new Building Centre in London (incorporating the Architectural Association Buildings Bureau) is a sign of definite advance in that direction. The new Centre will contain a permanent display of building materials and equipment, including practically everything from a door hinge to a domestic cooker. From what we hear, the space already booked at the new Centre is quite large; some 300 firms have shown practical interest, and the Electrical Development Association will be connected with it, and will see that the demonstration of electrical products does not fall short of what the merits of electricity in the modern house, office, public building or factory indicate as its proper prominence. We understand that the success of similar ventures in Germany and America have shown that there is a big opportunity for such organisations if properly run.

Carrier-Current Control

WHAT we believe to be the first system of control of public lighting by carrier current has been in successful operation in Springfield, Mass., for some six months. The superimposed frequency is 700 cycles on a 60-cycle system. This appears to be the least expensive and most promising method of remote control that has yet been put into service. It need not be limited to street lighting; by making the relays sufficiently selective, different control frequencies could be imposed to connect and disconnect various types of load at will. Thus the supply to thermal storage water heaters could easily be restricted to certain hours, and less essential supplies could be interrupted, if necessary, to save the rest of the system load in times of difficulty.

Is a Commercial Association Wanted?

IT is not our intention to reiterate our statement regarding the lack of an organisation through which commercial electrical men can express their views and can exercise a definite influence by initiating new movements or imparting energy to existing ones. Our views are known; our "Correspondence" columns have contained the opinions of a number of readers; and the Electricity Supply Commercial Association has given an account of its doings. The REVIEW'S suggestion was referred to at a recent public function by Brigadier-General Legge, who seemed to hold that if the idea could be carried into effect it would bring benefit to the industry generally. This is the last word, at the moment. We ourselves have nothing to add unless it be that somebody has got to take action or all our discussions will prove fruitless.

Reactance in Overhead Lines

THE relative costs of overhead lines and underground cables are roughly deducible from the Minister of Transport's statement in the House of Commons, reported in our "Parliamentary Notes." Similar comparisons in the past have been met with the objection that the average section of conductors is probably greater for underground than for overhead work, due to their being used generally where the loads are most dense. This consideration is, we believe, offset by the more liberal use of copper or aluminium in overhead lines in relation to the current carried, as this has hitherto been the commonly accepted method of compensating for their very much higher reactance, especially in view of the greater distances of transmission in rural areas. This somewhat crude method of voltage regulation has the advantage of providing a margin of copper, which can be made full use of later when the load warrants the use of regulators.

Circuit-breaker Testing

DURING the past week we have had conversations and correspondence with many of the foremost electrical engineers on the subject of a central testing station for high-voltage switchgear. The letter from Mr. Woodhouse published in our "Correspondence" columns states in a few words what we understand to be the views of a large majority. There is a consensus of opinion that a central testing station is most desirable; it would certainly be a less expensive method than the provision of independent stations by those manufacturers who can afford them. And what of the smaller switchgear manufacturers who cannot? To some extent it is a question of "load factor," and presumably there would be some diversity between the claims for service even of the largest firms. There would also be a very definite value attached to the certificate of an independent authority such as the E.R.A.

Load-factor Saturation

MR. FORREST has given some striking figures relating to load factors and consumptions per head in American industrial towns. It might be inferred by anyone not appreciating the context of his remarks that load factor might be expected to grow automatically with increasing sizes of distribution systems. It is not so easy as that. A high load factor has to be worked for. Actually the utilisation of generating capacity has steadily gone back in the U.S.A. during the past ten years, although the total output has almost doubled and supply areas have grown considerably. This is presumably due to the load factor having early reached a saturation level related to the type of apparatus then used. The cultivation of off-peak loads, such as water heating, will give a new and higher saturation level to be attained.

Repulsion-start Motors. By Percy Huggins, A.M.I.E.E.

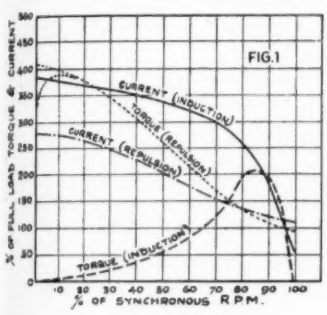
The quick diagnosis of possible troubles

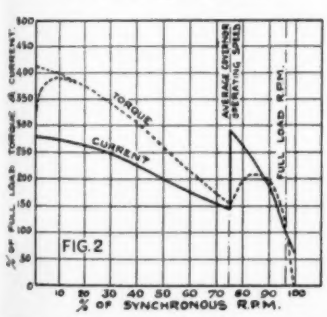
MORE than twenty types of single-phase motors can be classified under the headings "induction" and "commutator." The popularity of the repulsion-start single-phase induction motor has been gained by unquestioned superiority in those features most desired for the majority of purposes. It may be directly started by a simple switch; gives high starting torque consistent with low starting current; has large overload capacity; and reasonably constant speed under varying loads. It is very reliable, and usually gives long and faultless service, even when replacing a motor of another type which has failed under arduous starting conditions.

Operating problems call for a knowledge of the two types of which this motor is a combination, namely, the repulsion motor and the plain single-phase induction motor.

The machine starts as a repulsion motor, but on attaining a speed at which the accelerating torque would be greater as an induction motor (*i.e.*, at about 75 per cent. of synchronous speed), its operation is automatically changed to that of the latter type by a centrifugal mechanism which completely short-circuits all commutator segments through the medium of a ring or disc, which may be regarded as a squirrel-cage end ring. In about 70 per cent. of the motors now being supplied the automatic mechanism also lifts the brushes, thereby cutting out all brush wear and brush noise during running.

Designers usually construct two separate and complete circle diagrams for a repulsion-start induction motor—one treating





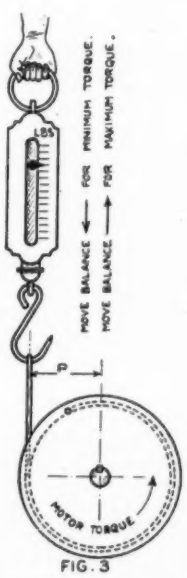


Fig. 1.—Speed, torque and current curves for repulsion and induction motors. Fig. 2.—Composite curves representing characteristics of repulsion-start induction-run motor. Fig. 3.—Measurement of static torque.

it as a repulsion motor, and the other as an induction motor—and are thereby able to predetermine its full characteristics.

Faults in Stator Coils

The stator winding is simply a single range of plain concentric coils. Only in the rare case of an electrically reversible motor is there a slight complication due to the addition of light reversing coils wound as a second range in quadrature with the main winding. Such a reversing winding, which is connected in series with the main winding, comprises approximately* 24 per cent. of the total stator turns, and reversal of its connections relative to the main winding changes the direction of rotation.

If a stator coil becomes short circuited the following symptoms are to be expected:—Undue noise and vibration: increase in current consumption at all loads: overheating of the short-circuited coil; and some reduction in starting torque.

Fully 70 per cent. of the motors are supplied with the stator winding and terminals arranged for series-parallel connection for about 230 V or about 115 V, and the majority of these operate on the higher voltage. This readily facilitates the checking of the division of voltage in the two half phases when connected in series. A half phase which has a short-circuited coil will show a lower voltage reading than that of the other half, but eccentricity of the rotor within the stator bore can produce similar electrical unbalance.

An open-circuited stator coil will prevent the motor taking any current when switched on to the mains, provided that all stator coils are connected in series.

Open-circuited Rotor Coil

Usually the first evidence of an open circuit in a rotor coil is a severe reduction in starting torque. If the rotor is allowed to turn slowly through one complete revolution, the torque will jump up to approximately its normal value as the two commutator segments to which the defective coil is connected come under a brush face. Then as one of these segments leaves the brush, sparking will occur at the trailing edge of the brush, accompanied by a sharp fall of the torque. If the starting load is sufficiently light to allow the rotor to accelerate, considerable sparking will occur up to the operating speed of the centrifugal device, after which the motor might continue to run without apparent defect as very frequently happens.

Mr. Percy Huggins is a member of the designing staff of Lancashire Dynamo & Crypto, Ltd.

If several rotor coils are open-circuited, particularly if non-adjacent, the motor may completely fail to start, even under a light load, and the current drawn from the mains will be considerably below the normal switching-on current. The rotor is constructed and wound exactly as a d.c. armature, except that the short-circuiting mechanism is added. Hence, if a fault involves dismantling the motor, an open-circuited rotor coil (or a short-circuited or reversed coil) can be located by the usual bar-to-bar voltage drop test.

Short Circuit in Rotor Winding

This defect is not apparent in the motor when running, because all rotor coils are then positively short circuited individually at the commutator by the action of the centrifugal mechanism, but its presence reduces starting torque by any amount up to 100 per cent., depending on the extent of the fault.

The existence of a rotor "short" can be quickly proved by first lifting all brushes off the commutator, and then switching

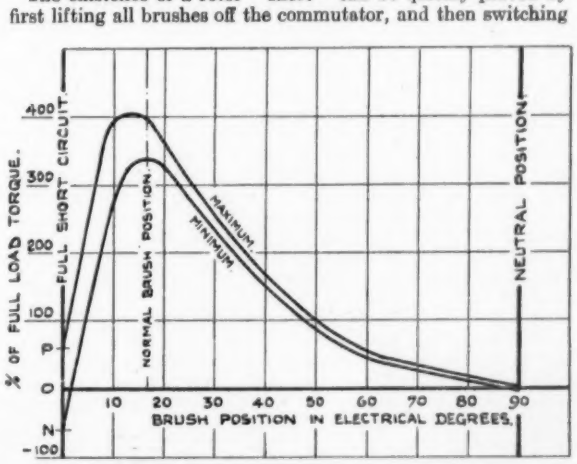


Fig. 4.—Change of static torque with varying brush position

the motor on to the mains. Under these conditions a correct rotor will not exert torque at any position in which it may be turned relative to the stator, and it can be freely rotated by hand in either direction; also the motor will take a steady

D

*$R \times Kr / M \times Km = \tan \theta$, where R = No. of turns of reversing winding; M = No. of turns of main winding; Kr = Distribution factor for R (average value 0.97); Km = Distribution factor for M (average value 0.8); and θ = Torque angle in electrical degrees (corresponding to angle of brush setting from full short-circuit on a motor not provided with a reversing winding).

current approximating to 56 per cent. of its normal no-load current.

If the rotor winding has a short-circuited coil, the rotor will tend to set itself so that the faulty section is displaced ninety electrical degrees from the stator coils, and it will resist movement from this position. The current induced in a short-circuited section will react on the stator current, and the resulting increase in the latter will be at maximum when the rotor is turned to a position where the axis of the "shorted" turns coincides with that of the magneto-motive-force of the stator winding. If the rotor is held in this position, the short-circuited turns will warm up, thereby indicating which they are; but care should be taken that the voltage is not applied for sufficient time to overheat any part.

Should there be undue stator current and rotational restraining magnetic forces, both of which exhibit no pronounced maxima and minima when the rotor is turned, this is symptomatic of general short circuiting of the rotor windings, such as would be produced by (*a*) failure of the short-circuiting gear to disengage properly, or (*b*) leakage round the commutator or its connections due to an accumulation of moisture, carbon dust, or other deleterious matter.

Other causes of short-circuited rotor coils are:—(*c*) breakdown of insulation between turns or coils, and (*d*) two or more earth faults on the windings or commutator. It should be borne in mind that the short-circuiting gear is not insulated from the shaft or rotor core. Hence, while the brushes are lifted, it is expedient to test whether the commutator segments are earthed, because a negative result eliminates both (*a*) and (*d*) as possible causes of the trouble.

Failure of Short-circuiting Device

With a motor not having brush-lifting gear the symptoms of incomplete short circuiting of commutator segments are slight sparking under the brushes when the motor is running, and, if the defect is of more than minor degree, a no-load speed above synchronous, as the machine then runs more or less as a plain repulsion motor, exhibiting in some measure the series characteristics of the latter type, as shown in the first diagram. On full load the speed by chance may be correct.

If the fault develops on a motor fitted with brush-lifting gear, the machine cannot continue to run as a repulsion motor, and the only symptom is incorrect speed. The trouble may vary from excessive slip to complete failure to accelerate beyond the operating speed of the centrifugal device, depending on whether the failure is partial or complete. Further, the centrifugal mechanism may be set oscillating due to the motor speed swinging about the point at which this device is set to operate.

Starting-torque Problems

All repulsion-start induction motors exhibit minimum and maximum static torque values which, as I have found on testing motors by eight different makers, assume ratios of from 0.95/1.0 to the poor value of 0.4/1.0. This result is due chiefly to a slight swinging of the axes of the rotor poles with varying positions of the rotor, and accordingly maxima and minima occur in one revolution as a function of the number of rotor slots and commutator segments.

A powerful corrective to the disturbing influences on static torque is brush-contact resistance, particularly as a relation between brush-contact volt drop and the e.m.f. of the rotor. Cases of low minimum static torque have been improved up to 100 per cent. by fitting brushes of higher contact drop, or by rewinding the rotor with less turns of bigger cross section. Obviously the latter expedient must not be exercised beyond the safe current-carrying capacity of the short-circuiting device or brush gear.

These facts form a guide to the following desirable design features:—A rotor voltage as low as possible; avoidance of brushes of very low contact volt drop; and numbers (not unreasonably small) of commutator segments and rotor slots that are not divisible by the number of poles. The last is not imperative if other features are well balanced, especially as certain slot combinations which tend to the highest possible minimum static torque are also productive of magnetic noise.

Determining Torque Values

The determination of maximum and minimum static torque values can be made with an ordinary spring balance subject to certain precautions. A flanged pulley is more serviceable than a brake arm because the former readily enables the torque fluctuations to be examined through one complete revolution of the rotor. The minimum torque points are picked up only by steadily moving the balance towards the pulley (*i.e.*, allowing the rotor to turn in the direction of its torque); and the points of maximum torque are found by drawing the balance away from the pulley. The torque fluctuations should be tested through one complete revolution, because sometimes they vary with different positions of the rotor due to slight irregularity in the spacing of the commutator segments. The radius of the pull should be taken as pulley radius plus half the thickness of the cord.

Assuming there is the usual single brush per point, non-contact with the commutator by one brush out of a set of four or more will reduce starting torque to a very low value. A similar fault on a motor having only two brushes (*i.e.*, with a two-pole lap-wound, or a four- (or more) pole wave-wound rotor) may actually reverse the direction of the starting torque, because the "useful" rotor circuit is completely broken, leaving only the current induced in the coils short-circuited by the face of one brush.

Brush Setting

The direction and magnitude of the starting torque is dependent on the brush position, the best setting for which may be found experimentally as follows: First find and mark the brush position which corresponds to full short circuit—*i.e.*, where the rotor poles are brought into direct opposition to those of the stator, so that the short-circuit current is at maximum and the effective torque nil. Then move the brush rocker 17 electrical degrees in the direction in which it is desired that the motor shall run. This is a good average torque angle for the highest minimum static torque, especially on four-pole machines (usually rather more for six poles and less for two), but an even better position to suit any particular drive often can be found by trial. With an electrically reversible motor the correct brush position is that corresponding to full short circuit with the main winding only in circuit; the reversing coils then produce the correct torque angle.

The curves illustrating the manner of change of maximum and minimum static torque with varying brush position may be applied to any motor to indicate its weakest points as affecting static torque. A large value of positive and negative torque (O.P. and O.N.), together with the occurrence of the highest minimum torque at an advanced angle of over 20 degrees, are indications that the rotor design lacks proper balance in those features already described as acting on static torque.

Vibration and Noise

Many of the purposes for which repulsion-start induction motors are used—such as the driving of ventilators and refrigerators in homes and hospitals—demand a standard of silence not ordinarily encountered with larger commercial motors.

The attainment of ultra-quiet running is primarily dependent on correct original design and manufacture, particularly in the matters of slot combination, slot skew, mechanical balance, sleeve bearings, and brush gear. But as no motor can be made perfectly noiseless, some responsibility also rests with the installation engineer to mount a motor so that its vibration and noise—slight though they may be—are not in any way amplified, but are localised and their progress through a building prevented.

The prevention of the transmission of vibration and noise (common to all classes of motors) forms a subject not only too extensive for treatment here, but one already rich in its bibliography. Experimental alteration in both the position and mounting of a motor will often entirely remove an annoying sound, *e.g.*, by carrying a motor on supports of rubber or other highly resilient material; most makers of small motors supply isolating fittings for this purpose.

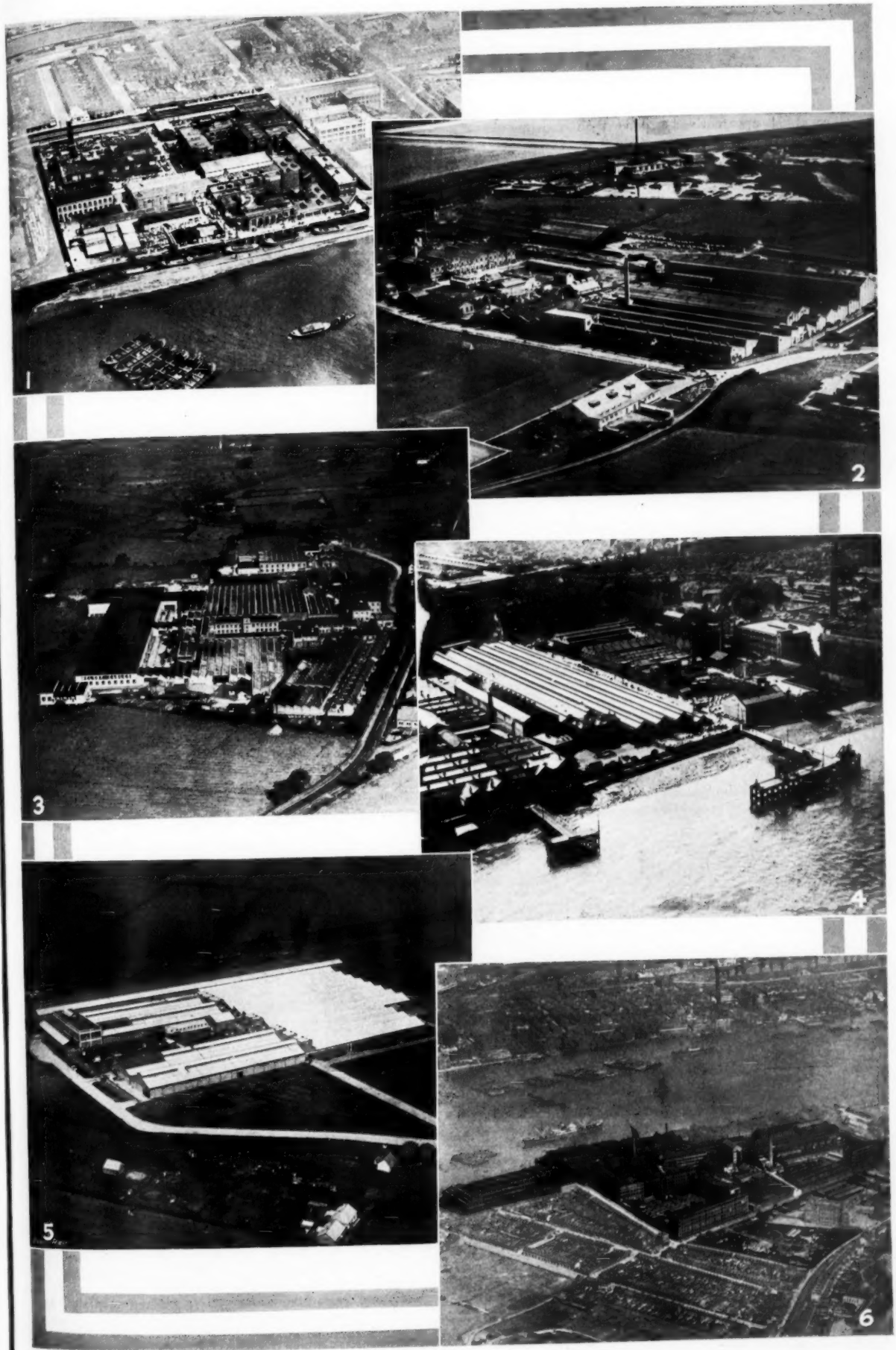
Rural Electrification in India

The construction of the extensive rural electrification scheme in the United Provinces is going on apace. Under this scheme power is to be generated from the falls of the Upper Ganges Canal, one of the oldest and largest irrigation systems of Northern India, and is to serve a purely agricultural area.

It is estimated that at the present rate of increase of demand the first stage of the development will be loaded up in five years and it will thereafter be necessary to harness one of the six remaining canal falls each year so as to complete the whole scheme by 1941. The Upper Ganges Valley Electric Supply Co. is already an active concern, and is rapidly extending its operations.

With a view to making this power as useful as possible to agriculturists, various experiments are being conducted for the application of electricity to irrigation on a small scale. The possibilities of driving Persian wheels by means of electric motors fixed at ground level are now being explored. Experiments just completed also show that the cost of irrigating wheat from large open wells by electric pumps using electricity costing one anna per kWh is Rs. 10 per acre, and Rs. 20 for sugar cane, which is about 33 per cent. less than the respective prices for oil engine pumping.

Good progress has been made with the Uhl River (Mandi) scheme in the Punjab. At the present time all works are either up to or ahead of schedule. Only about 1,100 ft. of rock remains to be drilled, and the three-mile long tunnel is expected to be finished this month. The work on the weirs on the Uhl and Lamba Dag rivers has made rapid progress, and the steel framework of the power house has been completed.



Six British Cable Factories from the Air

1. Standard Telephones & Cables, Ltd., North Woolwich; 2. Enfield Cable Works, Ltd.; 3. British Insulated Cables, Ltd., Helsby; 4. W. T. Henley's Telegraph Works Co., Ltd., Gravesend; 5. Macintosh Cable Co., Ltd., Derby; 6. Siemens Bros. & Co., Ltd., Woolwich.

Domestic Apparatus Design.

By Charles E. Baxter, A.M.I.Mech.E.

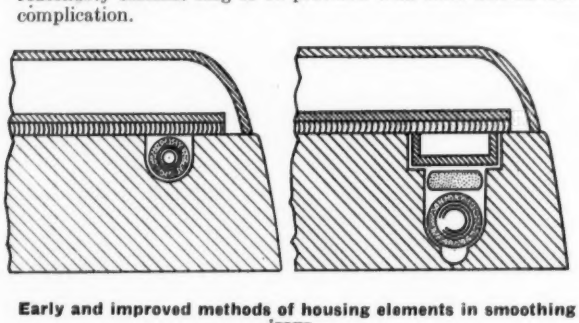
Electro-thermal considerations

ALTHOUGH the conversion of electricity into heat was one of the first effects to be noticed, its very simplicity seems to have been its undoing, as on the surface little further could apparently be done than provide elements of good-quality materials arranged in a reasonably sound mechanical manner. But actually we are not yet at the limit of the resources available in directing and controlling the heat flow.

Boiling Plates

By almost universal consent, leaving out the matter of regulation, the cooker of to-day is eminently satisfactory, with the exception of the boiling plates, which do not appear to be capable of providing either the efficeincy or "fool-proofness" of the gas ring.

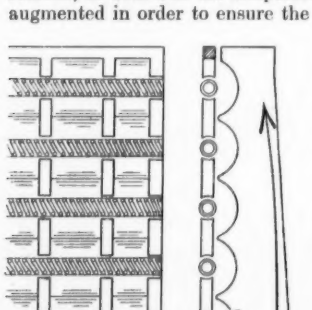
The heat of the latter has its point of emergence very close to the utensil, and, further, the heat evolved is properly directed; owing to the evolution taking place outside the contrivance there is no risk of damage resulting from action continuing without the utensil. This coupled with a natural proclivity for the hot gases to rise enables a simple and reasonably efficient ring to be provided with little trouble and complication.



Early and improved methods of housing elements in smoothing irons

In the closed hot plate we are limited to getting the heat away by conduction, but it is by no means certain that up to the present all the available methods have been fully drawn upon.

This type of plate is mostly constructed from materials with a co-efficient of thermal conductivity of the order of 0.160, and a diffusivity of 0.190, whereas plate materials are available with corresponding figures of 1.000 and 1.206, respectively. Copper has long been used in locomotive fire-boxes for these reasons, as with iron the temperature gradient has to be greatly augmented in order to ensure the necessary transmission.



Section through author's air-draught fire

It is evident, therefore, that the heat passing will vary directly as the time and area of section, and as this varies directly as the difference of temperature between the opposite faces the heat units passing are proportional to the co-efficient of thermal conductivity of the material.

At present, for electrical insulating purposes, we have to tolerate refractories with values in the same terms of approximately 0.0109, which apparently makers believe cannot be improved upon; but there is no reason why matters should be made worse by using a further material of unsuitable gradient. This has a bearing upon the allied problem of longevity, as it follows that it is possible greatly to reduce the initial temperature at the point of emergence or conversion, and by suitably arranging the surfaces to lessen the liability to damage when the assembly is left without the utensil.

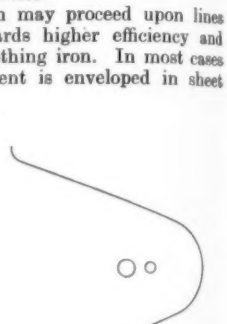
A New Idea

Latterly a new boiling arrangement has come into being with commendable features in the way of control, and this is much on the lines of experiments which suggested themselves to the writer some time ago.

Elements of this description involve the transmission principally by radiation, but unfortunately this takes place in all directions, precluding the full measure of efficiency being obtained and causing more or less inconvenience by heating up adjacent parts. The advantages of a gas ring accrue in some measure from directing the hot gases at about 1,400 deg. C. to the utensil. We can design an element to operate in this way at something approaching 1,100 deg. C. by making the element hollow and passing air through similar holes for directional purposes, thus providing greater facilities for getting the heat to the place required. Such experiments so far indicate advances in the way of efficiency, speed, and control, but it is yet too early to make serious claims for them.

Smoothing Irons

A typical example of how design may proceed upon lines that do not necessarily tend towards higher efficiency and better results is extant in the smoothing iron. In most cases the resistance part of the element is enveloped in sheet material possessing heat conduction properties in terms of watt-cm. per deg. C. of the order of 0.0037. The assembly is sandwiched between the base and a top slab, which receives a good proportion of the heat and has no provision for thermal flow to the working face at all. Furthermore, the assembly possesses horizontal thermal gradients in entirely the wrong direction, precluding the best results being obtained on the work. Ironing processes require a face temperature with accentuation at the toe and sides which meet the damp fabric first, a state of affairs which obviously requires the deposition of the source of heat at these points.



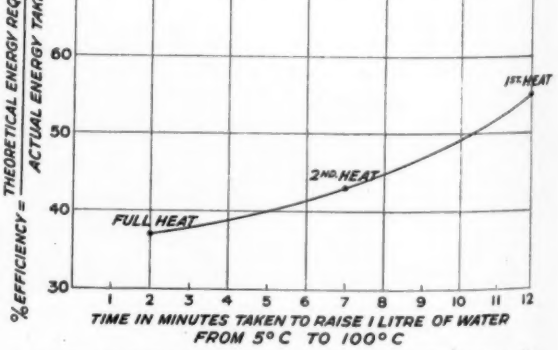
Elements in tandem in purely radiation fire

Not only has the device low efficiency in this respect, but the top face of the element is run at an unnecessarily high temperature, and the situation of the element entails a heat flow from the centre outwards. Latterly irons have been made by enclosing spiral wires in materials of a far higher coefficient of thermal conductivity than mica, but in some cases the deposition is bad, inasmuch as for expansion and other reasons the element is flush with the top face, entailing higher temperatures or thinner base slabs. The writer's experiments produced another design. By placing the element at a suitable position and depth, any flow can be arranged for without loss, top-heaviness, or running the element at undesirable temperatures.

Electric Fires

Broadly there are two schools of electric-fire development: radiation and radiation plus convection. The fundamental difference between these methods is one of direction, concentration, or control.

In the first type a wide-angle reflector is arranged with heating bars at or near its optical centre, so that efficient reflection results. Unfortunately, however, some regulation is needed which entails two bars in tandem, and the fact


% EFFICIENCY = THEORETICAL ENERGY REQUIRED / ACTUAL ENERGY TAKEN
%
70
60
50
40
30
1ST HEAT
2ND HEAT
FULL HEAT
1 2 3 4 5 6 7 8 9 10 11 12
TIME IN MINUTES TAKEN TO RAISE 1 LITRE OF WATER FROM 5° C TO 100° C

Suggested basic performance curve for boiling plates, &c.

that they both cannot be placed at the same point goes against the fundamental principles of the device. Nevertheless, the practice is commendable inasmuch as the principles are scientifically based, but the beam is naturally concentrated, and the device is rendered unwieldy by having to accommodate elements of some length.

In the second arrangement, typified by the spiral-refractory

combination, we have radiation from the front of the coil and little reflection, due to the low heat efficiency of the refractory. This type assumes a considerable working temperature, even though it be provided with ample ventilation. It is, however, compact and reliable, and it lends to mass production—all useful features.

In both arrangements we are confronted with the problem of getting the heat to the point desired, or into the room to be heated, and here some diversity of opinion exists. In the purely radiant fire heating is confined to diffusion by the objects in its limited path, while the other type possesses the objection that a higher temperature in the apparatus itself is necessary, which is clearly to be avoided if possible.

If each spiral could be fitted with a miniature reflector, the advantages of both types of apparatus would in some measure be secured and their drawbacks reduced. Clearly, however, in order to preserve compactness, a reflector of small radius is necessary, and as the close approximation of this to the spiral damages the surface, a method of preventing an all-round rise in temperature is required.

Proceeding on these lines the writer was led to what he terms the "air-draught type," containing provision for carrying away the heat by air flowing through suitable ducts. This results in a fire of different and pleasing characteristics, and one which quickly renders a room of even and comfortable temperature due to the general all-round temperature not requiring to be raised by first heating all kinds of objects of varying specific heat values, or by similar means and convection from the fire itself which is invariably vertical.

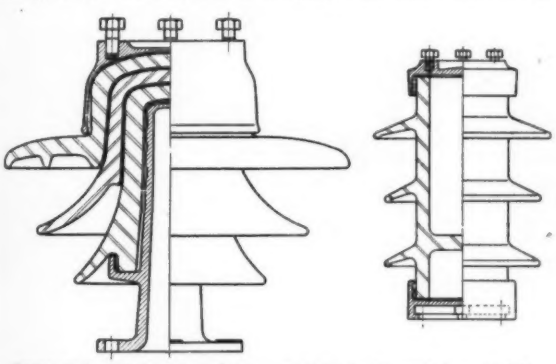
The subject of this article is extensive, and the scope for improvement wide, and although it is by no means assumed that all the views expressed will meet with universal acceptance, if attention has been drawn to some of the problems involved a useful purpose will have been served.

High-voltage Sub-station Insulators

THE development of radial cracks in insulators for high-voltage isolators and busbars in outdoor sub-stations was at one time attributed to thermal stresses in the porcelain superimposed on inherent cooling stresses. Under modern conditions most cases of cracking can be traced to the expansion of cement joints in "ageing."

In insulators of the pedestal type, the shells and metal parts are commonly joined by long courses of cement enclosed within the porcelain, and many manufacturers have inserted elastic layers, e.g., bitumastic paint (which have reduced the mechanical strength), and have diluted the cement with two or three parts of sand or ground porcelain to lessen the percentage expansion.

On the Continent the internal cement layers have been eliminated for the past five or six years, the insulators consisting of porcelain cylinders carrying rain sheds with metal



Cemented pedestal insulator. Cylindrical insulator, 44 kV

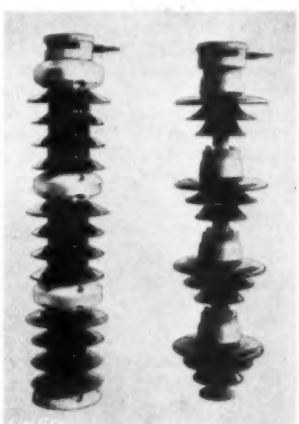
flanges cemented outside at the top and bottom. The elasticity of the flanges takes up any expansion of the cement.

The cylindrical construction has been developed in Great Britain by Messrs. Steatite and Porcelain Products, Ltd., who have supplied 132-kV switchgear insulators for recent grid sub-stations and have also exported a large number of the cylindrical type.

The use of a series of flanged castings has removed the disadvantage of the wide base, and the usual methods of fixing can be employed. As the new type is of essentially the same overall dimensions as the older form, there is no reduction of clearances. The flash-over voltage in rain is rather lower than that of the multi-part insulator, but the open rain sheds are found to provide better operating characteristics in polluted or salt-laden atmospheres.

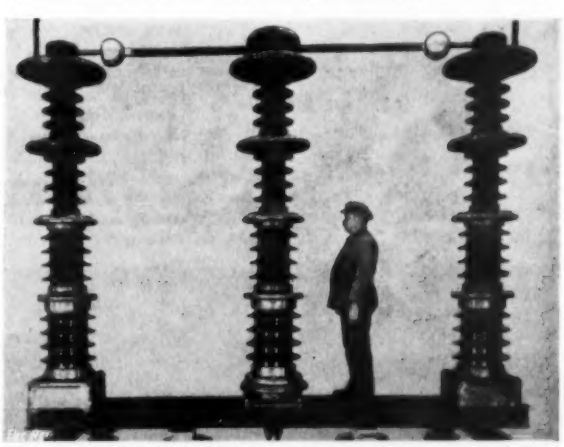
Shielding the creepage surface has proved to be ineffective in bad atmospheric conditions, and in recent designs of anti-dirt construction the greatest possible surface is exposed to natural cleaning. Bushing insulators, like those of cylindrical post type, present long exposed surfaces to the wind and rain which accounts for their remaining cleaner than multi-part switchgear insulators.

Flash-over on the inside of the cylinder is prevented by a horizontal porcelain plate, which is baked in one piece with the outer walls. This bridge is now placed well below the flange, which removes it from the intense electric field produced by the edge of the flange; this method lowers the centre of gravity, which is not in any case higher than the centre of the insulator—an important point in rocker-type switchgear as reducing the magnitude of mechanical shocks in operation.



Two types of 132-kV insulators

The cylindrical insulator is claimed to have greater torsional strength than the pedestal construction, due to the increased diameter of the bottom flange; the bending strength can be determined by adjusting the diameter and thickness of the wall. The requisite bending strength can be given for the higher voltages (where two or more insulators are bolted together) by making the bottom unit of larger diameter.



One phase of 220-kV isolator

Low-leakage Capacity Radio Valves

SOME remarkable figures are to hand concerning the grid-anode leakage capacity of "Osram" valves or the screen-grid type. The radio valves in question are the "MS4" and the "MS4B," six of each kind of which have recently been under test at the National Physical Laboratory, Teddington. In a report on the investigation the officials of the laboratory testify that they have measured the capacity between the control grid and the anode (the leakage capacity) for the series of valves referred to at a frequency of 210 kilocycles per second, the results being an average leakage capacity of 0.0025 mmF, the lowest values being 0.0023 for the "MS4" type and 0.0021 for the "MS4B" type, which are marketed by the General Electric Co., Ltd.

It has always been a primary aim in the design of these valves to make the grid-anode leakage capacity as low as possible, as it is appreciated that this is a criterion of overall magnification. The slight increase in the capacity of the "MS4" over the previously published figure of 0.0019 mmF is due, we are informed by the makers, to the system of electrode bonding now employed in its construction with the object of reducing "microphonicity." It has proved very successful in doing this. Even so, the revised figure of 0.0026 mmF average is as low as can be turned to practical advantage in a radio set. It is also interesting to observe the remarkable consistency in capacity apparent from the N.P.L. test on valves taken at random from stock.

Voltage Regulation. By E. T. Norris, M.I.E.E., Fel.A.I.E.E.

The Chief Designer of Messrs. Ferranti, Ltd., states the case for automatic regulation in distribution circuits

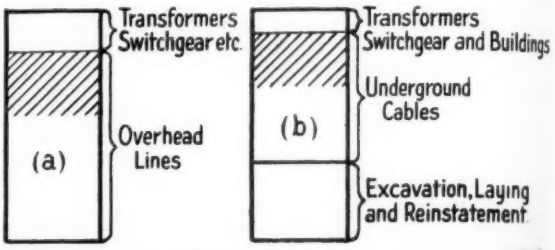
THE general public is beginning to realise the serious effect of voltage variations on the operation of all domestic apparatus, and to insist on its legal right to a constant pressure. An increase of only 4 per cent. in voltage halves the life of ordinary gasfilled lamps, and—of equal importance nowadays to domestic consumers—the effect is similar on the valves of mains operated radio sets.

Voltage variations are due to impedance drops in cables, transmission lines, and transformers. In high voltage and large power transmission lines, transformers with on-load tap-changing gear are frequently installed, but in transmission and distribution networks operated at 11,000 V and below, voltage variation has hitherto been controlled by increasing the cross section of cables and transmission line conductors far beyond the values necessary to prevent excessive heating or losses.

High Cost of Increased Copper Capacity

The maintenance of a constant voltage in this way greatly increases the cost of distribution. The annual capital expenditure in this country on distribution alone is £16 millions out of a total of £25 millions, including generation, according to Messrs. Dickinson & Grimmitt, in their I.E.E. paper on "The Design of a Distribution System in a Rural Area."

An analysis of these distribution costs is shown in the accompanying diagrams from this paper for overhead rural distribution, and from "The Design of City Distribution Systems" by Messrs. Beard and Haldane for urban and suburban underground distribution. Of the £16 millions spent on distribution, £14 millions is due to lines and cables; half of this cost is entirely due to voltage regulation (shaded areas).



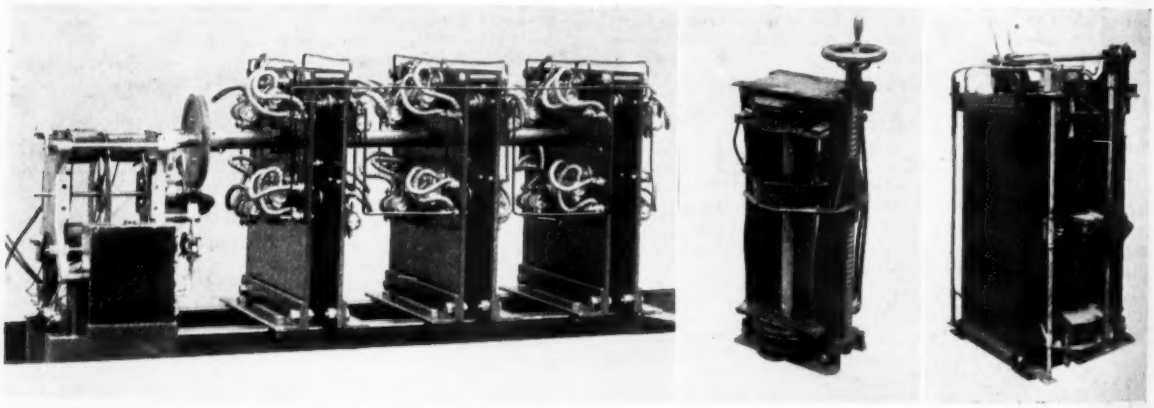
Capital costs of distribution systems:—(a) rural overhead; (b) urban underground

Even 25 per cent. reduction in this expense will amount to nearly £2 millions per annum. The enormous cost of maintaining reasonably constant voltage in this way is seldom realised, although most operating engineers will agree that even so it is a continual difficulty and source of anxiety.

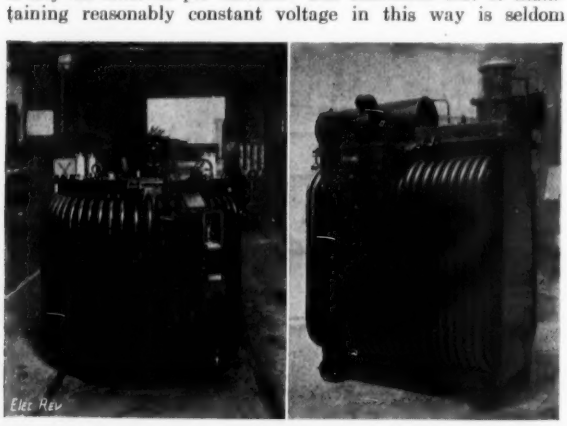
The problem of providing a reliable and economic means of automatic control which shall be independent of circuit constants and load distribution and variation is a difficult one. Smaller and simplified types of the on-load tap-changing gear, now almost universal on large power transformers, proved unsuitable for operation several hundred times a day, and were also too costly if made sufficiently robust for continuous operation.

Automatic Voltage Control

Two entirely new types of automatic voltage regulator—the mercury-switch regulating transformer and the moving-coil voltage regulator—have been developed. The two methods are largely complementary, each having its respective sphere of application. Both are at present available in sizes economically suitable for automatic operation in distribution circuits of 20 kVA and upwards.



Tap-changing mechanism of mercury switch regulating transformer (left); hand-operated air-cooled moving-coil regulator (centre); and moving-coil regulator—300-kVA, 6,600-V (right)



Three-phase (600-kVA, 11-kV) regulator

Mercury-switch regulator (300-kVA, 11-kV)

The moving-coil voltage regulator involves no switches, sliding contacts, or flexible connections, gives a uniform voltage variation without phase displacement, and is silent in operation; load and no-load losses are small.

The mercury-switch regulator—in conjunction with the step-down transformer—varies the voltage in 15 steps and involves negligible extra losses. The switches are totally enclosed in an inert gas, and, as they do not pit or burn, require no attention or inspection. The whole of the operating gear is, therefore, contained in the main transformer tank.

Automatic regulation is considerably cheaper than increased conductor section, as the following example indicates. For a 440/230-V, 3-phase distribution of 50 kVA over 0.3 miles, a transmission line costing £480 will be necessary to keep the voltage variation within 4 per cent. ("The Design of a Distribution System in a Rural Area"). If an automatic voltage regulator costing £75 is installed, and 7 per cent. drop permitted in the line, the cost of the line will be £210, giving a total cost of £285 compared with £480 without the regulator.

If the cost of losses in the line and regulator be included, the figures become £490 compared with £320 with the automatic regulator, a saving of 34 per cent. A more exact calculation, taking into account load distribution, interest charges, &c., shows a similar saving in cost.

The True Basis of Comparison

In one respect it is unfortunate that voltage regulating gear should be associated with ordinary transformers, since

(*Concluded at foot of opposite page.*)

Some Driving Forces in the Industry

The men behind Brook Motors, Ltd.

These are some of the principal men who are co-operating with Mr. Ernest Brook, the founder of Brook Motors Ltd., the alternating current motor specialists of Empress Works, Huddersfield.

Mr. Joseph Louis Brook, Assistant Manager and Director, has the internal control of the works.

Mr. Ernest Brook, the Chairman, who founded "Brook Motors" in May, 1904, served his apprenticeship with Messrs. Greenwood & Batley and started electrical engineering in 1890 with what is now the Yorkshire Electric Power Company, afterwards working in Stoke-on-Trent, Cardiff and Huddersfield. He was a member of the Huddersfield Town Council, 1922-1925, and has been Governor of the Technical College since 1921. He became A.M.I.E.E. in 1904.

He is a great believer in co-partnership, encouraging all his employés to be partners and shareholders; a system has been adopted by means of which they can acquire their shares on easy terms. The results are shown in the live position of the company supported by the energies of the whole of the staff. His two sons, Frank and John, are both employed at the Empress Works.

Mr. Willie Mills, Secretary and Director, has charge of the office and of commercial administration.

Mr. Albert Stocks supervises everything electrical, and has a life-long knowledge of motors.

Mr. John Bailey is the Mechanical Designer in charge of the drawing office.

Mr. Harold Dyson is responsible for all estimates and quotations.

Voltage Regulation (*continued from page 376*)

it leads to its cost being compared with that of the transformer, even to the extent of being considered as a percentage extra on the transformer cost. The price of modern distribution transformers being so low, it may easily be found that the regulating gear costs nearly as much as, or even more than, the transformer, but the true basis of comparison is either the saving in capital cost of distribution lines and cables due to the greater permissible voltage drop, or, alternatively, the increase in permissible loading of existing lines and cables when automatic voltage regulation is added.

Such comparisons always favour automatic regulation, and the saving shown by the shaded areas is many times the cost of the step-down transformers.

The Operating Aspect

Apart from cost, automatic regulation has many technical and operating advantages. Money spent upon extra copper in lines and cables is spent upon a rigid solution, which cannot be adjusted either way if the actual loading conditions should prove to be greatly different from those forecast by the engineer. Automatic voltage regulators can be standardised and made interchangeable, so that they can be moved about as the load varies and the voltage drop in one part of the system becomes of more importance than that in other parts; transmission lines and cables are not portable or interchangeable.

Another advantage of the regulator method is that regulation difficulties can be cured quickly, as it is very much easier and quicker to install an automatic regulator than it is to lay another cable or run another transmission line, even if provision has been made for running two lines over one set of poles. Increased copper section can only reduce the voltage drop in the lines and cables themselves, but automatic regulators can also compensate for voltage drop in the transformers, and thus permit the use of transformers having a greater reactance and voltage regulation.

Small transformers are considerably cheaper if the permissible voltage regulation can be increased, and a greater reactance ensures lower short-circuit current, and less disturbance to the system in the event of faults. Moreover, cheaper switchgear of smaller rupturing capacity is permissible. All of the foregoing advantages apply both to new installations and to existing networks. Automatic regulators can be installed as, where and when necessary, and the layout of the system may be planned without the strict regard for voltage regulation otherwise necessary.

Distribution the Main Task

MANY of the leading electrical bodies were represented at the official luncheon held at the B.I.F., Birmingham, on March 2nd, over which Mr. W. L. Chance presided. Proposing the toast of "The Industry," Mr. P. J. Pybus, C.B.E., M.P. (Minister of Transport), referred to the appointment of Mr. H. C. Siddeley to the Argentine, saying that he anticipated that it would lead to the building up of a national intelligence service.

He had the authority of the Minister of Health for urging that expenditure by local authorities on electricity supply should not be curtailed. The construction of the grid had given experience to electrical manufacturers that had placed them in a powerful position throughout the world; the rationalisation of generation had been a great advertisement for British engineering skill. Low-voltage distribution had not made the same advance, due in many cases to the parochial attitude of supply authorities. There must forthwith be a more rational grouping of the more than 600 distribution undertakings.

Capt. J. M. Donaldson (president, I.E.E.) referred significantly to the talk which Mr. Pybus was to have with the railway companies about road competition.

E.D.A.'s Advance

The E.D.A. dinner on the same day was presided over by Mr. G. H. Lake (city electrical engineer, Nottingham), who said that there were now fourteen Circles in the South Midland area. The Birmingham Circle had formed a company to build a specially designed all-electric house.

"The Electrical Industry" was proposed by Mr. H. B. Atkinson. He emphasised the false economy of certain undertakings in reducing subscriptions to E.D.A. and mentioned that the £68,000 spent on advertising "Eat more fish" had resulted in the consumption of more than £1,000,000 worth of second-grade fish and in revivifying the trawling industry. In the last twelve months Birmingham had laid 230 miles of cable and had connected over 24,000 new consumers, bringing the total to 118,000. An average of over 12,000 tons of coal are burned daily at the power stations, and the daily output had often exceeded two million kWh. Individual effort could not equal co-operation. E.D.A. was not an altruistic body; its work was an appeal to the pockets of every contractor, manufacturer, and supply authority.

Dr. A. H. Railing, responding, said that the worst of the trade depression was definitely over. It was to the interest of the supply undertakings that there should be a strong manufacturing industry to pay for research. The three corner stones of the industry were the I.E.E., E.D.A., and the E.R.A., and all sections alike benefited from them.

The toast of "The British Electrical Development Association" was proposed by Mr. F. Forrest (city electrical engineer, Birmingham), who pointed out that it was a reversal of all known trading methods that the buyer should run after the seller as was often the case in electricity supply. In generation we were near the limits of thermal efficiency, but distribution methods would be improved by changing over from d.c. to a.c.

Room for Improvement

Reductions in price would depend upon increased sales accompanied by improvement in load factor, which in the United States was from 40 to 50 per cent. (generated) in industrial towns compared with 30 per cent. in similar towns in Great Britain. The difference would mean 200 million kWh in Birmingham. In such towns the consumption per head averaged 1,400 kWh in America and 400 in Britain. This was not due to gas (as 20 per cent. more gas was used per head in New York than in London and 30 per cent. more in Washington than in Sheffield), but to commercial methods.

Mr. H. C. Lamb (city electrical engineer, Manchester), in reply, said that five years ago Manchester led Birmingham in output by 40 per cent.; last year the margin had dropped to 5 per cent., reflecting the loss of export trade to the northern towns. He did not accept the Minister of Transport's reproach of distributors in so far as it related to individual undertakings. Manchester had spent £250,000 in four years on cables and had connected 30,000 kW, but with very little effect on output owing to trade depression.

He pointed out that the marked increase in consumption for the whole country reported in 1926-27 followed the doubling of the subscriptions received by E.D.A., which pooled not only funds but also experience. He hoped more areas would follow the example of the area represented by Mr. Pinkney, who was able to report that 100 per cent. of the full E.D.A. assessment had been reached. He believed that the determination, energy, and ambition of Mr. Cramb would make E.D.A. of increasing value to the industry.

An All-welded Building

IN connection with the substantial extensions to its Walthamstow factory now in progress, Murex Welding Processes, Ltd., is demonstrating in a practical and convincing manner the possibilities of structural welding.

Unlike many existing welded buildings, the structure has not been designed as a riveted job, with the substitution of welds for rivets, but in every detail to obtain all the advantages to be gained by welding.

The building covers an area of 37,000 sq. ft., is 231 ft. long, divided into seven 33-ft. bays, and is 160 ft. wide. Twenty-two ordinary and 110 cantilever type trusses are spaced at 13 ft. 2 in. centres and suspended from six girders, the girders being supported on 12 braced columns.

The total weight of steelwork is approximately 132 tons, and does not contain a single rivet. The only bolts used are for the column foundations, anchor plates to the walls on end trusses, and for securing the wooden ridge purlins to the top boom of the girders.

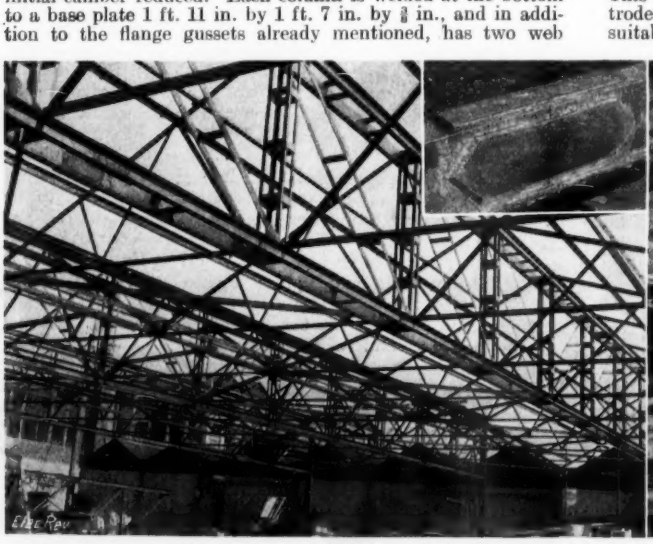
The columns were shipped to the site complete with welded gussets but without rakers. These latter were not welded in position until the girder was carrying its full load and the initial camber reduced. Each column is welded at the bottom to a base plate 1 ft. 11 in. by 1 ft. 7 in. by $\frac{3}{8}$ in., and in addition to the flange gussets already mentioned, has two web gussets. The main girders left the workshops in five sections, each section being set up on site in position.

The webs of the booms are drilled to take temporary fish plates, and by means of drifts each section was lined up and a good butt joint obtained. The top and bottom flange cover plates were then welded in position, after which the temporary fish plates were removed and replaced by permanent cover plates welded to the web and obscuring the holes.

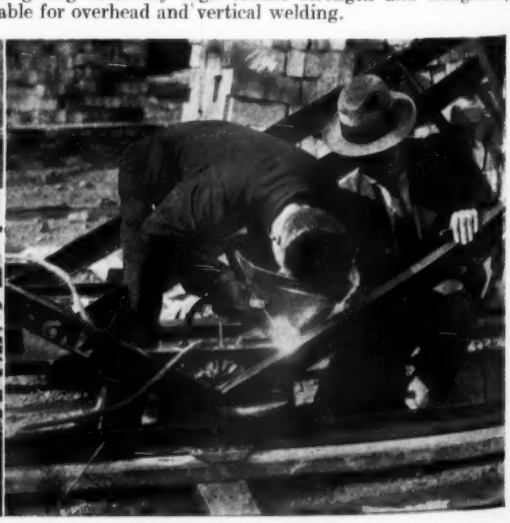
At each roof truss shoe there is a 9 in. by 7 in. base plate anchored to a concrete pad stone on the wall by two bolts. An angle is welded to the extension of the tie to locate and carry the pressed steel gutters, and the other ends of the truss are welded to the top and bottom girder booms, respectively.

Practically the whole of the welds, with the exception of the butt joints on the girder booms, are $\frac{1}{4}$ in. fillet welds, and not less than $1\frac{1}{2}$ in. long on any joint. The design basis for welds has been taken as 0.8 tons per 1 in. run of $\frac{1}{4}$ in. fillet, and numerous tests were taken on typical joints.

The electrodes used throughout are of the fully fluxed alloying machine made "Medex" type made by the company. This is a free flowing, good all-round general-purpose electrode giving relatively high tensile strength and elongation, suitable for overhead and vertical welding.



Murex all-welded building under construction; inset, joint weld on main girder



Welding a section before assembly

Electricity in Algeria

A review of the present situation and future developments

By F. K. BRENNAN (*British Vice-Consul, Algiers*)

IN Algeria the chief electrical enterprises are Lebon and Co. and the Société Algérienne d'Eclairage et de Force, both with headquarters in Algiers. Messrs. Lebon have been installed at Algiers since 1850. In 1927 they were granted a concession for the distribution of electric power in the Departments of Algiers and Oran, and they have installed several thousand kilometres of both high- and low-pressure cables. The capital of the company is 80 million fr., and its registered head offices are in Paris. The company has a working arrangement with the Hydro-Electric Company of North Africa, which has constructed a power station at Maillot in the Djurdjura mountains, with a capacity of 10,000 kW, and part of this output is being transmitted to Algiers at a high voltage.

The Société Algérienne d'Eclairage et de Force has a capital of 55 million fr. This company was founded in 1920, and it, too, operates in the two Departments of Algiers and Oran. It has about two thousand km. of cables in each of these Departments. Near Oran, at Mers-el-Kebir, it has a power station with 20,000 h.p. of plant. The electricity is carried by underground cable to the town of Oran, where a central

Modern lighting in the Municipal Casino, Algiers

sub-station transforms the power to 18,000 or 30,000 V to feed the aerial lines radiating to various industries and to the Oran tramways. There is also a power station at Fort National in Kabylia, 75 miles from Algiers. This company has an interest in a newer concern, the Société des Forces Motrices d'Algerie.

Their most important undertaking has been the construction of a super power station in the port of Algiers. This new station is to feed the existing transmission lines in Algiers and Oran. The machine room houses five groups of turbo-alternators developing 25,000 kW. Ultimately the station will be connected by 10,000-V cables to a sub-station at Hussein-Dey, the industrial suburb of Algiers, and will feed another sub-station to be erected near Algiers. It will be also connected by 30,000-V cables to a transformer station to link up with hydro-electric stations which the company intends to establish in the near future.

Extent of Electrification

In 1930 the generating plant in Algeria had a total capacity of 133,800 kW, and the total ouput was 134,480,000 kWh divided between lighting (35,770,000 kWh) and power (98,710,000 kWh). The growth of the use of electricity has been rapid as will be seen from the following table:—

Year	Output in kWh (millions)	Year	Output in kWh (millions)
1922	28	1927	79
1923	37	1928	80
1924	47	1929	112
1925	59	1930	134
1926	72		

In the chief Algerian towns there are electric tramways, and most of the larger houses have electric lifts. Electric heating and cooking apparatus is restricted in use owing to the high cost of energy, *viz.*, about 20 centimes per kWh. Very recently the Algiers authorities invited tenders for the construction and equipment of an underground railway at Algiers.

The gorge of El Kantara

Most important of all, however, is the development of rural electrification, as Algeria depends chiefly on its vines and its agriculture. Electric power is now being used for all sorts of agricultural work, such as sawing, cream separating, dough kneading, &c., besides its fast growing use, generated by large tractors, for harvest and threshing work. Much of the work in wine making can also be done by electricity.

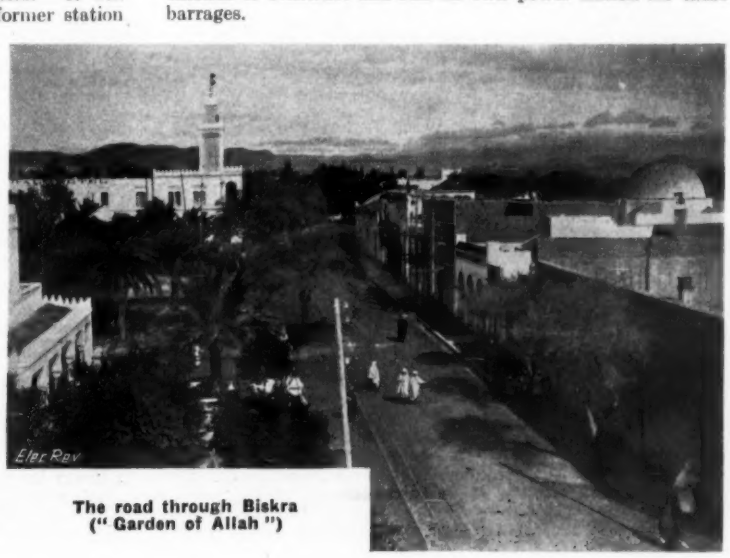
The rainfall in North Africa is irregular and insufficient, and so it is very important to plough the vineyards deeply. Agricultural labour here, too, is often lacking, and electricity helps to make up for this.

Finance, of course, sets the pace of electrical development. To electrify the whole of the Algerian Tell region would cost three or four hundred million francs, but the work is gradually being done, and the Government is willing to find all the money possible. A new Government service of rural engineering is charged with advising agriculturists and studying their electrification problems in conjunction with the electricity supply companies. The farmers' proposals are first submitted to the agricultural authorities for an economic verdict, and then to the rural engineering and public works officers for a technical opinion.

Prospective Hydro-electric Development

Unfortunately there are no navigable rivers in Algeria, so that the provision of barrage works for hydro-electric energy is difficult. There are now seven barrages in use in Algeria, the most important being the Habra barrage and the Sig barrage, both in the Department of Oran, containing 30 and 18 million cubic metres respectively. In the Department of Algiers there is the Hamiz or Fondouk barrage holding 14 million cubic metres. Three important barrages are now under construction: the Ghrib barrage in western Algeria; the Fodda barrage near Orleansville; and the Bou-Hanifia barrage south-east of Mascara.

The two important electrical companies in Algeria asked the Algerian Government for concessions to use the overflow from the Bou-Hanifia and other barrages for generating electric power. Up to the present, however, no concessions have been granted for this purpose. It looks as if the Government intends to construct and run its own power station for these barrages.



The road through Biskra ("Garden of Allah")

In eastern Algeria a typical example of the present spirit of enterprise is the electrification of the Bona plain. This has had to be done owing to difficulties of water and fuel supply for steam engines, difficulty in getting skilled labour for machinery, and the general slowness of working. From the point of view of reliability and economy, electric power is preferred to internal-combustion engines.

The landscape is showing indications of progress. High-pressure wires are carried mainly on concrete posts; for crossing railways and rivers metal posts are used. Low-pressure wires are on metal or wooden posts, the latter treated with sulphate of copper injected under pressure.

A Large New Station

What is reputed to be the largest electric power station in North Africa has recently been completed at the port of Bona. In 1923 a 5,000-kVA station was built at Bona, in eastern Algeria. At that time such a station seemed likely to be large enough for many years to come. The station had turbines of the Ljüngstrom type and four Babcock and Wilcox boilers.

In 1929 the Algerian Government decided to electrify the section of the Algerian State Railways dealing with the mineral traffic from the mines at Kouif, Ouenza and Bou-Kadra, as steam traction was unsatisfactory on this difficult single-line section. As the existing power station was insufficient, it was decided to build a super power station able to furnish enough energy not only for the railways but also for the whole district of Bona, and more than half of the Department of Constantine within reasonable reach of the high-pressure lines needed for electrifying the railways.

The railways found it necessary to build three sub-stations at Medjez-Sfa, Souk Ahras and Oued Damous. These sub-stations are equipped with 90,000/5,000-V transformers in order to reduce the 90,000-V three-phase current from the central power station to a pressure suitable for the use of the locomotives.

Although not fully finished the central station is already in use. It has four groups of turbines each of 10,800 kVA generating three-phase 5,500-V 50-cycle current. There are five new Babcock and Wilcox boilers with automatic stokers each with 500 sq. metres heating surface; these are in parallel with the four boilers from the original station.

In order to allow for sudden demands, due to the steep inclines on this section of railway and the heavy mineral traffic, the boilers are backed up by two steam accumulators.

A pressure of 90,000 V was chosen so that the current generated at 5,500 V at the central station could be carried to sub-stations and to the south of Bona. For this purpose a transformer station with three 15,000-kVA transformers has been built near the central station to step up the pressure to 90,000 V. A system of h.p. lines has already been erected.

Distribution System

The 90,000-V lines have been taken as far as Ain-Chenia, where a 90,000/30,000-V transformer feeds two lines, one to Ouenza and the other to Bou-Kedra, where there are mines. The line will soon be extended to Tebessa to supply power for the State Railways for the section from Oued-Keberit to Tebessa. When this has been done electric power will be available for the important mines of Kouif and Djebel-Onk.

Probably a good deal will be heard of Djebel-Onk. It lies south of Tebessa near the frontier between Algeria and Tunis. There are some three hundred million tons of exploitable phosphates and a 99-year concession to work them has been granted.

The end of the 90,000-V line at Ain-Chenia is near several important mines, some of them in Algeria, but most of them and the more important ones in Tunisia. A project is under way to supply all these mines with electric power from Bona, and eventually to link the electric power system in eastern Algeria to that in western Tunisia.

Future Extensions

Many villages are already being supplied with electric light and power. The Bona plain is receiving energy as well as the whole of the area between Mondovi and La Calle. The power system will shortly be extended to Tabarka. Eventually the draining of Lake Tonga will be undertaken. The Bona and Philippeville power stations will shortly be joined by a line passing through Ain-Mokra and St. Charles. Philippeville is already linked to Constantine by a power line.

Eventually the Constantine power lines will be joined to Algiers so that Algeria and Tunisia will be linked electrically; but the rate of progress of this important work will depend on the financial help given by the Government of Algeria.

One recent improvement at the port of Oran is an electrically driven coal transporter, able to lift 5¼ tons of British manufacture. This transporter can deal with 150 tons of coal in an hour; it has a 230-h.p. motor for lifting; a 50-h.p. motor for turning; and two 35-h.p. motors for travelling. It has a span of 20 ft. so that it can work all round the hold of a ship when discharging, and greatly reduce the trimming costs.

An Electric Restaurant in Glasgow

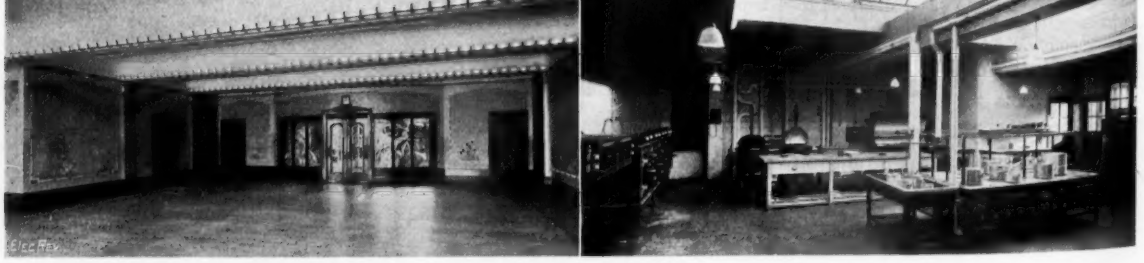
THE Georgic Restaurant of Messrs. R. A. Peacock and Son, Ltd., is situated in Union Street, Glasgow. It consists of a basement and four floors, the topmost of which is used for the electrically equipped kitchen, with a capacity to deal with 600 covers, which has entirely displaced the gas- and coal-fired apparatus formerly employed.

The installation comprises a quadruple set of "Magnet" roasting ovens with an additional cabinet roasting oven, a "Magnet" three-pan fish fryer, complete with canopy, draining trays and hot-cupboard, a double griller, and two "Magnet" boiling tables, each having eight high-temperature quick-boiling plates, varying from 24 in. by 16 in., to 8 in. by 6 in. Subsidiary units include a three-gallon water heater, two eight-slice toasters, a soup strainer, and a potato-peeling machine.

The lighting installation incorporates some novel features which provide a softly diffused light in all departments. Perhaps the most striking is the arrangement of the cornice lighting across the ceiling of the ballroom, the lamps being hidden behind ornamental glassware panelling. This type of visible illumination has the effect of breaking up space, and it has been adopted also in the shopping hall on the ground floor, where the installation is of a more distinctly ornamental character. In the smoke-room a sunshine effect is produced by a number of panelled skylights through which the light shines, fitted flush with the ceiling.

A "Magnet" telephone system connects all parts of the building, and there are two passenger and four service lifts by the Express Lift Co., an associated undertaking of the G.E.C.

Electricity is taken from Glasgow Corporation mains at high voltage and transformed. The maximum demand for the whole building is 220 kW, of which 38 kW represents the lighting load. The ironclad switchgear controlling the heat, power, and light sections, together with all wiring and lighting fittings and accessories, was supplied by the G.E.C., and Osram lamps are used throughout the building. The architects were Messrs. Whyte & Galway, with whom was associated Mr. John Robertson, the electrical contractor responsible for the whole of the installation work.



The well-lighted ballroom and the all-electric kitchen at the Georgic Restaurant, Glasgow

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

How France is Standardising Frequency

LAST week's informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS was a joint one with the British section of the SOCIÉTÉ DES INGÉNIEURS CIVILS DE FRANCE. Mr. W. E. Bradshaw, supported by Major F. M. G. Du Plat Taylor, the president of the British section of the French society, was in the chair, and he introduced Monsieur P. Rieunier, who had made a special visit from Paris to introduce the subject to be discussed, namely, "The Standardisation of the Frequency of Electricity Supply in Paris." Monsieur Rieunier, for whom Mr. R. A. MacMahon acted as interpreter, exhibited a cinematograph film illustrating in a series of changing charts the manner in which the standardisation of the frequency to 50 cycles in the Paris area was carried out.

In July, 1919, the power stations in the Paris area, of 451,950-kW capacity, were grouped for administrative purposes into two companies only. They were all steam stations and in an unsatisfactory state due to intensive running during the period 1915-1918. The programme adopted for their replacement was to build in Paris, or within a radius of six miles, large modern generating stations having boilers with an evaporating duty of at least 55,000 to 65,000 lb. of water per hour, working in conjunction with generating units of a minimum output of 40,000 kW.

A NATIONAL NETWORK

It was decided to interconnect the new stations and, further, to connect them with the hydro-electric stations of the Central Plateau (a 60-kV ring main round Paris, and lines at 120 kV and 220 kV connecting the Central Plateau to Paris) and to create a national network at 50 cycles from which the electrification of the railways could be carried out with d.c. at the highest voltage commercially practicable.

France imported every year one third of the total tonnage of coal consumed. It was, therefore, expedient to reduce the consumption either by installing new and more economical generating sets or, better still, by harnessing waterfalls. The price of the energy delivered in Paris from the hydro-electric stations of the Central Plateau by a line at least 190 miles long at a voltage of 120 kV would be equal to that of energy generated there by steam stations.

The first stations to be erected were those in the Central Plateau, because they would be the nearest and also because they would attain their full output in winter when the demand from the Paris area was at its maximum.

A RADIAL SYSTEM

Instead of having, as in England, a grid or ring France has a series of lines radiating from the principal centres of consumption. The main trunk lines from the hydro-electric station areas feed into these centres and, if required, these lines can be utilised for the transmission of steam-generated energy back to the hydro-electric areas. Generation in the coal-mining areas has not yet been actively developed.

The standardisation has been carried out in accordance with the following principles. The existing forms of supply are being maintained, while three-phase/two-phase interconnection is carried out by means of transformers between the new 60-kV and the existing distributing networks. In Paris the two-phase to d.c. liaison is effected by means of new and larger rotary units or by mercury-arc rectifiers. The cables, transformers, other distribution plant, and all inside installations remain unchanged.

On the 25-cycle network all motors are replaced either by new or second-hand motors having twice the number of poles. Mechanical problems in connection with the driven machinery do not therefore arise.

On the 41 2/3-cycle network all motors were kept in service in the majority of cases, and the mechanical units to which they were connected have been adapted to deal with a 20 per cent. increase of speed, either by changing the pulleys in belt transmission cases or by changing the gears of centrifugal pumps, or if necessary by changing the pumps themselves, &c. Special steps were taken in connection with lifting gear and other apparatus of a similar nature. The retention of these electric motors was only possible because it had been general practice to manufacture them in 50-cycle frames; consequently the rotating portion was only speeded up to the figure for which it was originally designed.

On the 55 1/3-cycle network the only machines which necessitated any modification were those used in connection with centrifugal pumping plant. All the work was carried out without putting in any additional lines. This could only be done by taking certain risks and forgoing some, and sometimes all, standby plant.

SURPRISING SPEED

Mr. Roger T. Smith said that the film was a little startling as a revelation of the pace of conversion and the members of the Central Electricity Board present must have envied the success of the French engineers. It was really a question whether an entire national change-over was worth while, for there must be large industrial districts, especially in coal-mining areas, in which the change-over was a doubtful proposition. It was interesting to note the way in which the Pyrenees, with a number of small lakes at different levels, had been developed and he wondered how Monsieur Rieunier viewed the Mediterranean district where there were long transmission lines linking scattered consumers on 25 periods. Could the cost of change-over be recovered within, say, two generations?

The Lord Mayor of Liverpool announces his arrival at the A.T.M. Social Club's dance (*See p.* 392)

Mr. W. E. Highfield thought it was wrong to suggest that this extraordinarily creditable piece of engineering was finished with and forgotten. It was a model of skilful organisation. The question of frequency change had been tackled by England and France and, he believed, Japan and the United States were contemplating the problem.

Mr. J. W. Beauchamp asked how the current growth of supply had been handled during the change-over. Mr. A. F. Harmer said the conversion from 25 to 50 cycles was a question of organisation and spending money. It was where there was a slight change of frequency of, say, from 60 or 55 to 50 cycles that there was a temptation to take risks and it was then a matter of careful engineering.

Monsieur Rieunier, in replying, said that in the change-over many more small motors were revealed than had been calculated for, and this was a source of much trouble. A great deal of difficulty was caused by the motors of calculating machines and similar apparatus, as they were generally of foreign manufacture, and new built-in motors also had to be imported with the franc at a particularly low rate of exchange.

Seeking the Architect's Collaboration

A TWO-DAYS architects' conference on electric lighting was arranged by the Electric Lamp Manufacturers' Association last week at the Lighting Service Bureau.

Mr. H. A. Lingard, chairman of the E.L.M.A. Council, outlined the functions of the Bureau in his introductory remarks. Over £100,000 per annum was spent on research alone by its supporters, he said, and its Savoy Hill premises were to be extended in the near future. He hoped to see the ties connecting the architectural profession and the electric lighting industry greatly strengthened by closer understanding.

Mr. Waldo Maitland dealt with the aims and objects of architectural lighting, pointing out that success was dependent on complete co-operation between engineer and architect. The utilisation of comparatively large areas of translucent or opaque surfaces to transmit or reflect the light enabled lighting to be used at much higher intensities with a lower brightness than would be possible with point sources. But the most important aspect was the fact that luminous or lighted surfaces could be so arranged as to emphasise architectural features, at the same time providing character and atmosphere.

Mr. Maitland then went on to deal in detail with the effect of light on various surfaces and forms, with the effects of transmission of light through various types of glass, and with exterior lighting.

Mr. R. Grierson spoke of the provision of electrical services, such as distribution, wiring, switching, &c., dealing almost entirely with technicalities. The engineer had made available the conveniences of electricity, but it was the architect, he pointed out, who must plan for the convenience of its utilisation.

Mr. Lingard's subject was floodlighting. He emphasised the importance of ascertaining whether a particular building would respond to treatment. It should obviously possess some architectural pretensions and be pleasing to the eye, otherwise it had better be left unlighted unless its illumination served some advertising purpose. Secondly, the condition and colour of the building surface must be carefully studied to see to what extent the light projected upon it would be absorbed; inadequate wattage was a very common fault.

BUILDINGS ADAPTED TO FLOODLIGHTING

Most of the really successful floodlighting installations of modern buildings had been those where the architect had had floodlighting in mind from the commencement of the design, and therefore provided adequate facilities for the concealment of projecting equipment in suitable positions.

Mr. W. J. Jones described some special problems, particularly the illumination of churches, libraries, and art galleries. He gave data which should be of assistance in deciding on the kind of installation to be embodied in the architectural ensemble. In view of the many types of equipment available, he suggested that, after the preliminary decision had been made, the architect should ask a firm of competent illuminating engineers to draw up a concrete scheme and thus get the engineering clearances and details settled before completing the design.

He visualised in this new development that the relationship between the architect and engineer would be such that the architect would call for certain contrasts in brightness, and the engineer would be asked to furnish those contrasts. In many instances the contrast values were below 30 to 1 and could, therefore, be shown faithfully on a wash-drawing. This was likely to be a great advantage, since the architect would be able to complete his design on paper and know that it could be reproduced. In the extensions of the Bureau to which Mr. Lingard had referred, they were proposing to include a range of built-in lighting elements and to collect data as to their performance and use.

Mr. F. March described the lighting requirements for commercial buildings. He said that the number of people stopping at a shop window where the lighting was periodically increased was 200 per hour with 15 ft.-candles, 244 with 40 ft.-candles, and 284 with 100 ft.-candles.

The modern tendency was not to restrict the advertising to the window only, but to make the whole of the front of the building an advertisement in itself by (1) bathing the whole or part of the building in light, or (2) making the whole or part of the building front luminous.

Sir John Brooke, vice-chairman of the Electricity Commission, in his introductory remarks on the second day, described the conference as a marriage feast of art and science; there was no doubt that the fruit of the union would be of real value.

To those whose purses were more restricted than their aspirations, both lighting and lamp fittings were the most difficult of domestic problems. While one could not reconcile oneself to the type of pendant or bracket which had been evolved by draping ornamentation round the gas-pipe, one could not afford to follow the rhomboids, the eccentric circles, or the towel-rail tubes of current fashion with the knowledge that the fashion which gave them their greatest, if not their only, value to-day would next year regard them with special contempt reserved for last season's good taste. Unless supplies were available at reasonable rates, it would be of no use asking them to design houses fully equipped not only with adequate electric lighting, but also with those facilities for the use of power which, since the next generation was obviously destined to see the extinction of domestic service in middle-class households, would be the necessary basis of civilised domesticity.

A NATION-WIDE SUPPLY

Within the next six months he anticipated that the Commissioners would have practically completed the allocation of powers and corresponding duties to authorised undertakers for the supply of electricity throughout all areas, save those which were very sparsely inhabited. In all urban and suburban areas electricity would be fully available within the next five years, as it was practically available at present. In the rural areas it was safe to say that there would be a supply in almost every village with a population of over 500.

Within the next five years they would everywhere find available, if not compulsory, a two-part tariff; that was of very great importance in considering the additional cost between minimum lighting, adequate lighting, and that generous scale which they should call proper lighting.

The house of the future must provide points so that every movable power-using plant or other appliance could be attached to the nearest point on the wall. Those considerations introduced a definite electrical engineering problem in house design, and it would be necessary and profitable to secure the collaboration of competent engineering advice in any intelligent layout of domestic premises.

The Working-class Consumer

A LECTURE on "Electrical Development, with special reference to Domestic Electrification," was given before the North Midland Area of E.D.A. on March 2nd by Mr. J. N. Waite, city electrical engineer, Hull.

Mr. Waite held that the selling was of equal importance to the manufacturing side. He stressed the importance of catering for the working-class houses and of reasonable and simple tariffs, and said he had abolished meter rents, as the charge was entirely illogical and the cost of meters should be part of the administration charges.

The biggest market was no doubt electric cooking; he had put out 5,000 cookers in three years and 77 per cent. were in working-class houses. Cooker rentals should be economic, and the rental based on, say, a ten years' life. Cost of maintenance had been small, only averaging one visit per cooker in two years.

It was important to use the correct type of utensil with electric cookers and a skilled demonstrator should visit each new consumer, not to show her how to cook, but how to use electric cookers. With every cooker his department had supplied an electric kettle, and at 1s. 6d. per quarter rental these were a paying proposition.

The department did not do any wiring; this was all let out to contractors on an agreed schedule rate. The speaker considered that it was not the business of supply authorities to do wiring, but to sell electricity as cheaply as possible.

Assisted house-wiring jobs were coming in at the rate of 100 per week and development was very rapid in all districts. Arrangements had just been made to make 508 working-class houses on one estate all-electric.

Electric water heating had not yet been developed, owing to the extreme hardness of the water which caused very hard scale, but it was hoped to solve this difficulty at a very early date.

The Trend of Steam Boiler Practice

PRESENT-DAY steam boiler design and practice, and the trend of development are surveyed in the paper which Mr. John Bruce read at the INSTITUTION OF ELECTRICAL ENGINEERS yesterday, March 10th, comparisons being made with representative contemporary plant in America, the outstanding thermal performance and efficiency of which is commented upon.

The greatest difference in the trend of design between the two countries is in the wider adoption of higher operating steam pressures in the United States, the increase in the individual boiler unit capacity, and the extended use of pulverised fuel, particularly on the "unit" system. A number of American generating stations are consistently producing a kWh for a heat expenditure of under 14,000 B.th.u., which is due to the advanced state of plant development, the high standard of employé engaged in boiler house operation, and the consistency of fuel quality.

The present tendency is towards the use of one boiler unit per turbine, with a spare to cover "outages," and boiler units capable of evaporating one million lb. of water per hour have been successfully put into operation.

AMERICAN CONDITIONS

The adoption of the water-cooled furnace for both stoker and pulverised-fuel equipment is now standard practice, and in some cases as much as 65 per cent. of the total heat liberated in the combustion chamber is absorbed by the water walls. The water-cooled furnace has, further, proved to be a beneficial factor in the maintenance of long periods of operation, as boiler outages are mostly due to maintenance of furnace refractories.

Though the majority of America's newer generating stations are operating at the lower pressures, it is noteworthy that at the moment there are over fifteen boiler units operating successfully in the neighbourhood of the high pressures. For a new station the decision between the adoption of 600 and 1,200 lb. per sq. in. operating steam pressures is governed by the cost of coal, the anticipated load factor over the life of the plant, and the increased capital costs which are involved by the adoption of the higher pressures.

PRESSURE AND CAPITAL COST

The capital cost increases rapidly with increase of pressure above 600 lb. per sq. in., but the improvement in efficiency increases slowly. If good quality coal is obtainable at $4 per ton of 2,000 lb. and the load factor is under 50 per cent., the increase in capital charges may more than offset the gain in heat efficiency resulting from the adoption of the higher pressures. The largest turbine yet considered for these higher pressures has a capacity of only 14,000 kW.

Temperature appears to be stabilised in the neighbourhood of 800 deg. to 850 deg. F., but the Detroit Edison Co. is putting a plant into commission to operate at no less than 1,000 deg. F.

The chain-grate type of stoker becomes uneconomical from a first-cost point of view, and also involves structural difficulties as compared with pulverised-fuel firing, when considered for boiler units having a greater evaporation than 200,000 lb. per hour. The serious rival to pulverised-fuel firing is the retort or cascade type of stoker. The returns for 1930 showed that the number of unit-system pulverised-fuel-fired stations under construction was three times that of stations designed for operation on the central system; equal performances can be obtained

with either, but with capital charges slightly favouring the unit system.

British Practice

The outstanding feature of British practice has been mechanical stoker development. Travelling grates can now be applied to boiler units of from 250,000 to 300,000 lb. per hour. Their first cost has, however, increased in more than direct ratio to the increased size. They are operating up to combustion rates of 70 or 80 lb. per sq. ft. of grate area.

The paper contains examples of the thermal efficiency of both stoker and pulverised-fuel plant in Britain. There is a considerable amount of confusion about the meaning of "overall thermal efficiency." Where does the boiler plant begin and end?

The performance of a large representative British pulverised-fuel plant is tabulated, and it is shown that the overall boiler-house efficiency for a year is in the neighbourhood of 85 per cent. It is apparent that the upper limit of attainable efficiency has been reached with present designs.

Reliability

Reliability of existing designs of boiler plant is a subject seldom discussed publicly and in detail. The reliability of the large modern turbo-alternator and its auxiliaries has reached a degree far in advance of that inherent to the modern boiler unit. Investigation points to the fact that one factor is lack

A charming feature of the Holophane demonstration
(*See p.* 392)

of attention to detail in design and construction, coupled, in many instances, with an attempt to design and build a plant down to a price rather than up to a definite specification. It should only be necessary to open a boiler unit for internal examination once a year, that is, when laid out of service for annual survey and overhaul.

A detailed analysis of the operation of the pulverised-fuel-fired boiler plant previously referred to, for the year 1930, shows that the majority of the hours lost were the result of furnace brickwork troubles and superheater defects. "Bird-nesting" in the first bank of generating tubes was the cause of further lost hours on three units. All these troubles are discussed in detail in the paper. On no occasion was the pulverised-fuel preparation plant or burner equipment the cause of any compulsory boiler outage.

Factors in Design

Factors in design which affect reliability and operation are sub-divided as follows: (i) under water-heating and evaporative parts the author discusses the trend towards higher ratings and suggests that the conventional present-day boiler form is unsuitable for development for high rates of heat transfer, and that such rates can only be effected by radiant heat, necessitating very radical changes in boiler unit form.

He suggests generally that for the commonly accepted boiler-unit forms the average rate of evaporation per square foot of total water-heating surface at normal load should not exceed 5.5 lb. per hour. The need for further development of soot-blowing apparatus is also stressed. (ii) The vulnerability of the modern superheater location is emphasised. It is suggested that with the demand for still higher superheats, development in design is necessary to provide a superheater location where definite and separate control of superheat temperature can be effected. Superheater troubles within the experience of the author are given, and these include records of temperatures which superheater tube materials have to withstand in everyday practice; they have a very small safety margin.

A radical departure must be made from existing forms of hangers, suspension beams, and other such accessories; some sort of air-cooled construction is indicated. The reason for the failure of element-securing studs is still obscure. The magnitude of superheater problems may, in the near future, result in radical alterations of the boiler unit form.

Combustion Chamber Arrangements

(iii) The importance of combustion chamber design is emphasised, and the advantages and limitations of water-cooled walls are discussed. With certain arrangements of pulverised-fuel firing adapted to a boiler unit of particular design and utilising high temperature preheated air, the refractory can be entirely eliminated. Where the design necessitates the partial use of refractory material it is possible to water-cool the whole of the combustion chamber, including the arches, by means of wall water tubes, and where required these can be encased in shaped refractory blocks.

The most important factor in chamber design is the fusion temperature of the ash, which makes the subject more complicated here than in America, where a plant may operate for the whole of its life on one particular class of coal.

Briefly, the use of full furnace water cooling will permit the highest possible heat release and the use of small furnace volume, but flexibility in operation will be limited, and this design can only be successfully applied to boiler units which are to be normally operated at, say, from 0.75 load to 1.20 load. Further, this type of design actually increases the total boiler heating surface required. The possibility of utilising a smaller volume can also negative any potential advantages, since smaller volume reduces the time element available for the completion of combustion.

It follows that with this type of design a high degree of turbulence is necessary and in some cases special overhead air booster fans may be needed. For the bulk of the fuels used in this country combined water-cooled and refractory walls will give the best results.

(iv) The suggestion that powdered-fuel firing has many advantages over stoker plant is qualified by the need for all concerned to be fully conversant with the subject. The author favours the bin-and-feeder system for large stations and suggests units of not less than 500,000 lb. of steam per hour.

Gilbert's Researches

THE early history of magnetism was outlined in a paper which Mr. J. B. Kramer read at a meeting of the Newcomen Society at the British Industries Fair at Birmingham last week. Few authentic accounts of the subject are available. The author divided his paper into five epochs: the discovery of magnetism, 95-52 B.C.; first applications, 13th century A.D.; first experimental researches into magnetic properties, 1269 A.D.; the compass, 13th to 16th centuries; and the discovery of terrestrial magnetism.

Mr. Kramer supports the theory that the magnet was discovered accidentally by one of the Grecian tribes, called the Magnetes, who originally inhabited Thessaly. The discovery was made in one of the settlements in Asia Minor, in the province of Lydia, about 600 B.C., possibly by workers in iron-stone mines or a shepherd whose hobnailed sandals and iron crook became fixed to the bluish-black "lodestone" rocks.

William Gilbert, of Colchester, dealt comprehensively with the subject in his *De Magnete*, which Mr. Kramer considers contains the foundation of magnetic science. The work was based on careful lines of systematic research, and was the result of 199 magnetic experiments and 84 original diagrams and drawings.

Gilbert was not willing to accept a single record left behind by any previous investigator of magnetism. He repeated and examined afresh in his own ingenious way every one of the magnetic properties which had been known, by then, for over 2,000 years, and this he did most conscientiously. His greatest and entirely original contribution to the science of magnetism was his discovery and proofs that the earth is a natural magnet in itself.

The Merits of Pulverised Fuel

THE use of powdered coal, with special reference to power station practice, is the subject of the paper which Mr. S. B. Jackson read at the Institute of Marine Engineers on March 8th.

It is suggested that direct firing systems are being increasingly applied, principally due to their lower initial cost. Coal of high calorific value and small ash content, of uniform grading as delivered to the bunker, is most suitable for efficient combustion.

Powdered coal and stoker thermal efficiencies are compared and costs examined, the conclusion reached being that pulverised-fuel firing will be increasingly adopted and may eventually take the place of other systems in power stations.

The high combustion efficiency possible results in high thermal efficiency, and the greatest heat liberation per cu. ft. of available combustion space is obtainable. The ability to use high temperature preheated air increases the overall efficiency and reduces capital cost.

Mechanical disadvantages of grates and stokers, when subjected to high temperatures, are eliminated and reliability is improved. The possibility of building the largest boiler units conceived, the economy of capital cost, the ease of adaptation to heavy overload requirements, and the facility of automatic control, are other features of the system.

Parliamentary Notes (BY OUR SPECIAL REPORTER)

ON February 29th, Sir K. Wood, Postmaster-General, informed Mr. McEntee that the number of wireless licences taken out during the year 1931 was 4,329,170. No record was available of the number of unlicensed wireless stations traced during the year. The number of prosecutions undertaken was 1,042, and the total amount of the fines imposed was £1,933, in addition to costs amounting to about £240.

Answering Mr. Hall-Caine, Sir Kingsley Wood said that it was difficult to estimate precisely the number of additional wireless licences taken out as a result of the detector van campaign which commenced in October last, but between September 30th and January 31st the total number of licences in force had increased by about 544,000. The greater part of this increase might fairly be regarded as directly or indirectly attributable to the campaign.

The Teleprinter Service

On February 29th, the Postmaster-General stated that under the new teleprinter system a telegraph exchange service would enable messages to be sent over the public telephone exchange system by means of leased teleprinters, between any two subscribers at any time. He hoped it would be possible to provide this as a local service in London within about three months' time, and to extend it to the provinces and to include trunk service by stages during the course of the summer. The rent to be charged would be £65 a year.

Teleprinters leased from the Post Office would be available for sending messages over any of the renter's private wires. The rental would be the same, save that on certain types of private wire the technical conditions would not necessitate the use of a voice-frequency convertor, and where this was the case a teleprinter at £50 a year at each end would suffice, if the renter did not wish to communicate with other subcribers over the exchange system. A teleprinter (with voice-frequency convertor) rented for either purpose would also be available for the other form of service, without additional charge. The new type of teleprinter could be purchased from the manufacturers by any firm for internal use over its own line-plant.

Costs of Transmission Lines

On February 29th, the Minister of Transport (Mr. Pybus) informed Mr. Turton that it was only possible to give approximate figures of the relative costs of underground and overhead lines as these depended upon a number of factors such as the market price of copper and lead for underground cables and of the materials used for overhead line conductors; the voltage and current-carrying capacity of the lines; the nature of the rural roads in which the cables were laid and hence the cost of excavation and re-instatement; and the number of poles per mile in the case of overhead lines. An analysis of the returns of over 200 authorised undertakers who were supplying in rural areas at the end of March, 1930, showed that the average expenditure incurred up to that date on high-pressure systems in general was upwards of £1,000 per mile for overhead lines as compared with over £1,600 in the case of underground mains, a difference of over 60 per cent.

The expenditure in the case of l.p. systems in general was upwards of £560 per mile on overhead lines as compared with upwards of £1,100 on underground mains, a difference of about 100 per cent. Since that date there had been a substantial fall in the price of materials and an alteration in the relative costs, particularly in the case of low-pressure systems. Estimates at the present time indicated that the approximate costs per 100 yards now ranged between the following figures:

Voltage.	Approximate cost per 100 yd.	
	Overhead lines.	Underground cables.
33,000	From £42 to £57	About four times the cost of overhead lines
11,000	From £20 to £31	From £68 to £102
400/230	From £28 to £40	From £34 to £71

The analysis showed that out of upwards of 7,300 miles of h.p. and l.p. transmission and distribution lines provided by the 200 undertakers in rural areas at the end of March, 1930, about 59 per cent. were underground cables and 41 per cent. overhead lines. No later analysis was available.

The Highlands Special Order

On March 2nd, Mr. Barclay-Harvey asked the Minister of Transport if he had yet received the Scottish Highlands Electricity Special Order from the Electricity Commissioners or if any further difficulties had arisen over this Order.

Mr. Pybus said that the Electricity Commissioners were waiting to hear whether one of the local authorities in the area was now prepared to consent to the granting of the Order in the form in which the Commissioners proposed to make it.

Special Orders

Special Orders have been approved in respect of the borough of Appleby, the urban district of Kirkby Lonsdale and Shap, the rural districts of East Westmorland and West Ward, and part of the rural district of South Westmorland, in the county of Westmorland, and the urban district of Carnforth and part of the rural district of Lancaster, Lancashire; the rural district of Gower, Glamorgan; for the amendment of the Newcastle-upon-Tyne Electric Lighting Orders, 1893 and 1911; in respect of the urban district of Blaenavon and parts of the rural districts of Abergavenny, Pontypool, and Magor, Monmouth; and in respect of part of the royal borough of Kensington.

New Books

Industry and Education in Soviet Russia. By J. G. CROWTHER. 94 pp.; illustrated. London: William Heinemann, Ltd. Price 7s. 6d.

Whatever one's views on modern Russia may be, one is compelled to take notice of the tremendous experiment which the Soviet Government has in hand. The success of this experiment is very largely dependent upon education, particularly technical education, and Mr. Crowther's monograph is a succinct account of this aspect of the Russian system.

The author gives facts without many trimmings and sets forth details and statistics of a number of institutions. Close contact between industries and educational establishments is known in England, but in Russia the technical institutions are really a part and parcel of the industries with which they are concerned. Under this system not only do the works officers take turns in lecturing to the students, bringing the severely practical view forcibly before them, but the industries draw from their schools the best of the students, thus obtaining a high-grade personnel.

The interest of the book is enhanced by appendices entitled "Casual Observations"—a brief study of the conditions under which the Russians now live and "A Meditation on Bolshevism," discussing Russia's place in modern civilisation and her probable future.

Submarine Telegraphy. By ING. ITALO DE GIULI. Translated from the Italian by J. J. MacKichan, O.B.E., A.M.I.E.E. Pp. x+225; 173 illustrations. London: Sir Isaac Pitman and Sons, Ltd. Price 18s.

This is an excellent practical manual on submarine telegraphy, and, so far as we are aware, no other book dealing with the practical side of the subject has been published within recent years. It comes, too, at an opportune moment, as it is within the last few years that the most striking advances have been made in submarine telegraphy. The author is the manager of the Italian Submarine Cable Company, and he has been fortunate in his translator, Mr. MacKichan, of the Engineer-in-Chief's Department of the General Post Office, who has added two appendices giving additional information on the subjects of signalling speeds and sea earths.

The book describes clearly, with little use of mathematics, the apparatus now used and the methods of working, operation and testing. It should be in the hands of all students of the subject, and will be found useful, too, to those interested in allied branches of electrical communication.

* * *

Shorter Notices

"Lubricating Oil Tests," by J. E. Southcombe. Pp. 69; figs. 11. London: Henry Wells Oil Co. 2s. 6d.—In this work are explained the various methods of testing lubricating oils and the practical significance of such tests.

"The Donnan Equilibria," by T. R. Bolam. 154 pages, 12 figs. and 29 tables. G. Bell & Sons, London. Price 9s.—The characteristic feature of "Donnan equilibria" is the conclusion that the presence in an electrolyte of a species of ion, which is restrained in any way from diffusing to all parts of the system, will cause unequal distribution of every species of diffusible ion. The present work receives high commendation by Prof. F. G. Donnan, who laid down the principles in 1911.

"Laxton's and Lockwood's Builders' Price Book, 1931." Pp. 1,290. London: Kelly's Directories, Ltd. Price 7s. 6d. net.—The 115th edition of this work contains the new rate of wages and gradings which came into force on February 1st this year; all the information has been corrected and revised, and the list of specialities and proprietary articles (10,000) has again been extended.

"The *Mechanical World* Electrical Pocket Book, 1932." Pp. 395; illustrated. Manchester: Emmott & Co., Ltd. Price 1s. 6d.—A feature of the latest edition of this useful little publication is the inclusion of a new section on electric welding and cutting. The sections on power plant operation, electric traction, lamps, etc., have been brought up to date.

"The Blue Book" (Directory and Handbook of the Electrical Engineering and Allied Trades), 50th edition. Pp. 1,454. London: Ernest Benn, Ltd. The present volume contains, in addition to the information included in its predecessors, a financial section providing statistics relating to position of electricity supply, transport and telephone companies, &c.

"The Modern Diesel." Pp. vi+142; illustrated. London: Iliffe & Sons, Ltd. Price 2s. 6d.

Correspondence

Correspondents should forward their communications as early as possible. No letters can be published unless we have the writer's name and address in our possession

Round or Square?

In your issue of February 26th under the heading " Domestic Cooking and Heating " it is stated that we are fitting round plates to our cookers because there is a demand for these on account of the prevalence of round cooking vessels.

We should like to point out that our standard plate is rectangular and we are still satisfied, and so are the majority of our customers who purchase our cookers, that this plate offers better service to the consumer than the round plate besides being more convenient from the point of view of the construction of the cooker. For instance, the overall size of the cooker can be kept to a minimum, an important feature in these days of small kitchens, and yet quite a high loading can be arranged in the boiling plate.

The only reason that we are now offering as an alternative cookers fitted with round plates is the fact that the " Chromalox " boiling plate is only made in this shape for domestic cookers. We are satisfied that the plates are an excellent proposition in every way and we wish to give our customers an opportunity of purchasing them, should they wish to do so.

THE JACKSON ELECTRIC STOVE CO., LTD.
S. C. Hurry, *Sales Manager.*

London, S.W.1.
March 1st, 1932.

Trams *versus* Buses

The letter signed by Mr. J. Baggs in your last issue contains an indictment of the attitude of the electrical engineer towards tramcars. The facts of the case are very much simpler than represented. The electrical industry is essentially progressive and resolutely refuses to flinch when it comes to a matter of lopping off dead wood.

Of the many criticisms of the tramcar that have so frequently been made, I would pick out two as conclusive evidence of its unsuitability to modern traffic conditions: (1) The tramcar is essentially unwieldy and immobile and it occupies a great deal of space in the roadway where it can least be spared. (2) Tramcars are the only known vehicles allowed to stop suddenly and without warning and then proceed to deposit and pick up passengers in the middle of the road.

Many visitors to the British Industries Fair at Castle Bromwich must have noticed the one permissible layout for tramcar tracks; two parallel lines in the centre of the route with uni-directional roadways for motor traffic on either side.

G. W. LAMOTTE.

London, S.W.3, *March 4th*, 1932.

Circuit Breaker Research

The paper which Mr. H. W. Clothier has presented to the Institution of Electrical Engineers on the subject of circuit breakers will, I hope, convince everyone interested in the manufacture and use of circuit breakers that the present state of ignorance as to the behaviour of circuit breakers under severe conditions on large transmission systems should not be allowed to continue, and that every effort should be made to establish without delay a testing house in which new designs may be proved and the whole problem of circuit breaker design verified by tests on an adequate scale.

Interconnection with the national grid requires the provision of circuit breakers of a rupturing capacity of over 500,000 kVA at the busbars. There is no means in this country of determining whether the circuit breakers now being provided will satisfactorily perform their duty under all operating conditions. There are many situations on a large transmission system in which the necessary rupturing capacity is to-day a matter of guesswork.

This should not be so, and in the interests of the reliability of our national system and the progress of our great manufacturing industry it is to be hoped that the fullest support will be given to those who are endeavouring to establish such a station.

W. B. WOODHOUSE,
Engineer and Manager, Yorkshire Electric Power Co.

Leeds, *March 7th*, 1932.

The " Earth " Fallacy

In your current issue we notice a letter dealing with the question of earthing, particularly in relation to domestic apparatus. There appears to us to be one serious mis-statement in this letter, in which the writer indicates that *most* vacuum cleaners are now double insulated.

It would seem probable that he is referring to our machines as pioneers in this respect; we are not aware of any other machine, British or otherwise, in which this precaution has been taken. It should, however, be agreed that a number of machines are now produced in which the motor is completely mounted in insulation as by rubber packing for example, and we ourselves make use of this method in some of our models, thus producing the effect of double insulation.

We quite agree with the conclusion that earthing of this class of apparatus is unnecessary, if the machines are sufficiently well insulated, and would say that at a recent sales conference some forty branch managers reporting on experience of over 100,000 machines advised that not one solitary case of electric shock had arisen in connection with our machines; and in no case were these machines earthed.

Two cases, one of shock and one of burn, were reported due to damaged flexible, but the circumstances indicated that earthing would have given no protection in these instances, and we are more than a little inclined to suspect that the three-core flexible necessary for earthing, would have proved more susceptible to damage than the standard two-core which we employ. Certainly this would be emphatically the case if the diameter necessary for the three-core flexible were utilised for insulation by making the two-core flexible up to the same size.

In any case where there is doubt about rough handling of flexible, we strongly recommend that adequate protection should be given by extra heavy insulation, rather than by the provision of an earthing wire, which, in point of fact, appears to give no protection whatever.

BRITISH VACUUM CLEANER AND ENG. CO., LTD.,
J. Hambridge, *Director and General Manager.*

London, S.W.6, *March 3rd*, 1932.

An Unreliable Profession

I believe that there is something seriously wrong with the profession of electrical engineering, and I am writing this in the hope that some member of that profession can remove this belief and suggest why a fully trained and qualified engineer is to-day unable to make a living at his own job—a position for which there is no parallel in any other profession.

I find it difficult to accept the reasons which apply to so many occupations to-day, namely, " general depression " and/or " overcrowding." We read so much in the Press regarding new electrical development schemes that there appears to be a boom in electricity.

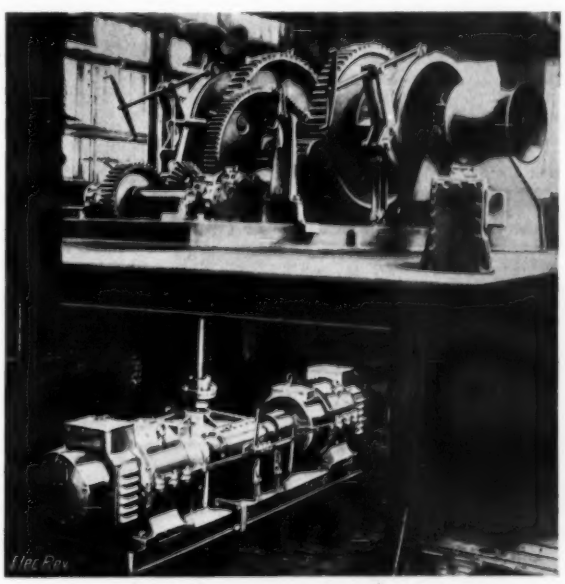
The particular case which I have in mind at present—I have had experience of others not dissimilar—is that of a well qualified engineer about 36 years old who finds himself to-day in a critically serious plight as a result of being unable to find any employment during the past twelve months through no fault of his own.

As a youth he went through the mill; he served an apprenticeship with a well-known firm of marine engine makers, and spent four evenings a week studying for an engineering degree. Before taking this degree war broke out and he spent the major part of 4½ years in France.

At the end of the war he returned to his studies and obtained a degree at one of our best known universities. Since then he has had a thorough electrical experience and has held progressively important appointments. He was employed on special duties in the electricity department of one of the largest corporations in the country while he has been responsible for the installation of power plant and the design of distribution schemes over large and important areas, in addition to having managed a supply undertaking.

Not only does his experience cover technical matters, as the nature of his work has necessitated administrative ability and commercial knowledge. He has had experience in financial matters and has sat in conference with " greybeards " when his opinion has been received with respect.

I mention these few points to make it clear that I am not referring to a novice. I have formed the opinion that his work has been well done judging by some of his testimonials. He is a man of the highest integrity and in the words of one of those testimonials he " has a fine personality and is a hard



A large Clarke, Chapman windlass (*See p.* 390)

worker," his appearance and physique are above the average and he is sound in wind and limb.

I know that he has spared no effort to obtain a position—even the most humble—his application for appointments, which read as though made to suit his qualifications.

Had this man entered the professions of medicine, church or law, I am convinced that with his ability he would to-day occupy an honourable position and that without such a large monetary or labour expenditure as it has cost him for his training and experience as an electrical engineer.

Let me ask the members of the profession of electrical engineering, who in my opinion are responsible for the position, why should such an appalling disgrace be permitted and what is the solution to the problem?

March 7th, 1932. DILEMMA.

The National Register

In commenting on the new list of names of those enrolled in the National Register of Electrical Installation Contractors, you suggest, quite appropriately, that those contractors already on the Register should act as "missionaries" and endeavour to persuade their competitors in the same town to qualify.

But there is also another and more effective method of persuasion, namely, by those who place, or recommend the placing of, wiring contracts. Partly in their own interests these consultants, architects, or station engineers who appreciate all the implications of the National Register have it in their power to discriminate in the placing of such contracts, or to ask their Electricity Committees or boards (as the case may be) to pass a suitable resolution. In that way they can be of great assistance to their representatives who have been nominated as members of the Registration authority, apart from other considerations. V. SINCLAIR.

London, N.W.2, *March 5th*, 1932.

The Distribution Problem

In reply to Mr. Lesser's letter in your last week's issue, may I point out that local authorities and companies between them have been raising capital for electricity purposes during the last few years at the rate of approximately £30 million per annum, of which approximately £19 million per annum has been for transmission and distribution, involving the connection of approximately 400,000 consumers annually? These figures do not include any amounts borrowed by the Central Electricity Board.

In the next few years, due to the co-ordination of generation, it should not be necessary to raise such a large amount of capital for generation and therefore, without increase of borrowing, over £20 million per annum can be spent on distribution development. All I am pressing for is that this work should be accelerated and extended into rural areas so as to ensure the connection of at least 600,000 consumers per annum.

Judging from the results of recent issues, there would be no difficulty in raising the money required and obviously the answers to Mr. Lesser's queries as regards rate of interest and sinking fund depend upon the nature of the authority which undertakes the work. Capital charges, however, should not in the aggregate exceed 8 per cent. or 8.5 per cent.

The average price per unit will obviously vary inversely with the sales but should reach a figure of, say, 1.5d. when sales reach a figure of 200 to 250 units per head of population.

London, S.W.1, *March 8th*, 1932. J. M. KENNEDY.

These Discounts

I am glad to see, as I had suspected on reading his first letter, that "Fair Play" is really in agreement with me. The extract he gives from the instructions to his salesmen differs from our own instructions only in detail, and these differences are such as could be easily resolved into complete agreement.

This makes three small motor manufacturers who have very nearly the same ideas, and who have said so publicly. Are there no others?

March 1st, 1932. VANADIS.

I must take exception to the remark by "Real Fair Play" in his letter in your current issue. He speaks as though it is usual for salesmen to sell at all costs.

I do not deny that there are salesmen without any sense of honour and they, and the firms which employ them, are parasites upon the industry. I do contend, however, that no sales engineer worthy of the name would lend himself to such underhand methods. "Real Fair Play" should note that there is honour in business and that those of us who are members of the Institution of Electrical Engineers have promised to uphold the honour and integrity of our profession.

J. CLEMENT TURNBULL,
Leamington Spa, *March 5th*, 1932. Grad. I.E.E.

Large Resistance Furnaces

THREE large resistance furnaces have been provided by G.W.B. Electric Furnaces, Ltd., for the Banbury works of the Northern Aluminium Co., Ltd.

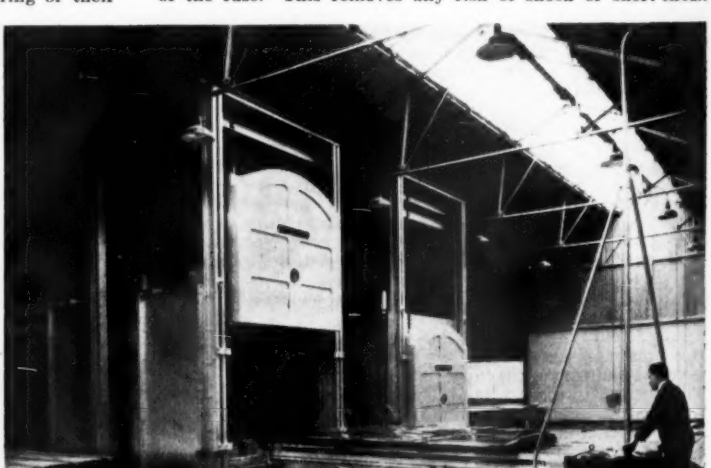
Two of these are among the largest furnaces of the type installed in this country. They have chambers measuring 14 ft. long by 7 ft. wide by 5 ft. high to the spring of their arched roofs; the third one has a chamber 9 ft. 6 in. long by 4 ft. wide by 3 ft. to the spring of the arch. They are all fitted with Wild-Barfield patent centrifugal fans, which, beside assisting uniformity from end to end of the furnaces, greatly decrease the heating time required for a charge to attain its desired temperature.

The chambers of the furnaces are lined with Wild-Barfield tunnel bricks, which house thick rod elements in a patent hairpin form, the ends of each hairpin being thickened to four times the element area where they pass through the insulation at the back of the furnace to avoid hot connections and loss of power. The side and roof elements are connected up at the back of the furnace to suit the 400-V, 3-phase circuit, the sides being on one phase, the roof on another, whilst the floor elements, to obviate risk of any leakage of current through the charge, are connected to suit a lower voltage obtained by means of single-phase, oil-cooled, double-wound Ferranti transformers, wired to the third phase, making a total load of 200 kW each in the large furnaces, and 100 kW in the small one, all phases balanced.

The floors are provided with longitudinal grooves to accommodate the arms of a "Gibbons-Van Marle" patent charging machine, which is hand operated in the case of the small furnace, and electrically driven in the larger ones. These machines enable a load to be placed in, or removed from, the furnace in less than two minutes, with a consequent saving in heat due to the doors not being opened for a considerable time. It is also possible to raise and lower the charge gently, reducing wear on the hearth to a minimum.

All the furnaces are equipped with "Foster" thermo-electric automatic controls, which operate the coils of the main "Brookhirst" contactors through a small relay, forming a means of accurate temperature control. The main current to the furnaces is automatically cut off, should the temperature become excessive, with risk of damage to the charge or the furnace elements, by means of a thermal fuse, which consists of a loop of fusible wire inserted in the furnace and held by a removable porcelain carrier, forming a readily removable unit. This wire is connected in series with the main contactor coil, so that immediately the wire melts the coil circuit is interrupted, which in turn cuts off the main current.

In this same coil circuit there is a Wild-Barfield patent double-pole door switch, having one pole connected to each side of the fuse. This removes any risk of shock or short-circuit should the elements or fuse be accidentally touched during charging or discharging. One of these switches is also used to interrupt the fan-motor circuit whenever the door is opened, in order that heat may not be lost due to the heated air being blown out through the open door.



The two large furnaces referred to in this article

The complete control equipment and transformer of the smaller furnace are mounted on a platform fixed to the wall above it, and in the case of the larger ones the control equipment for both is mounted on uprights between the furnaces. Each door of the large furnaces weighs 2½ tons, the total weight of fireclay and other bricks used in the construction of these furnaces amounting to approximately 24 tons, and that of the nickel-chromium rod-heating elements to over ½ ton.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Electrically Operated Spotlight

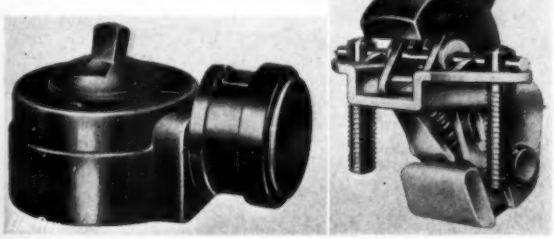
A feature of the new 1,000-W spotlight manufactured by the STRAND ELECTRIC CO., 24, Floral Street, Covent Garden, W.C.2, is that the colours are changed electrically. On the lantern itself are four solenoids which are the medium for operating the colour frames and placing them in front of the lens, the return action being aided by a counterweight and spring. The advantage of an operator being able to control from a stage switchboard or operating box a number of these spotlights in various parts of the house is obvious, and adds another step to one-man control of lighting and colour in stage illumination.

The "Strand" spotlight

Small All-insulated Switch-socket

It is suggested that the "Lincoln" s.p. shockproof switch-socket recently introduced by Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall, rated at 15 A and to two-pin B.E.S.A. gauge, is probably the smallest unit of its rating yet offered to the trade. The exterior is similar in design to the "Lincoln" lighting switch, the cover, operating dolly and the two-screw cover-fixing arrangement being practically identical. The moulded, flat-top plug is of the side-entry pattern, and is provided, for safety, with a workmanlike adjustable cord grip.

A particular feature of the interior is the ingenious quick make and break switch mechanism. It is entirely of steel. Each small part is cadmium plated to prevent corrosion, and the movement works on a bronze bearing securely locked to the bridge. Excellent contact is made by a solid copper rod arranged with a floating action in a china block.

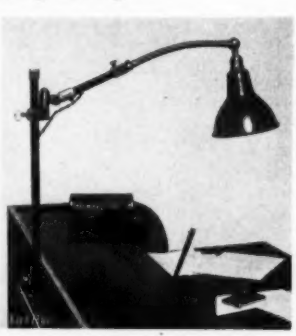


Exterior and movement of "Lincoln" switch-socket

The manufacturers point out that this new switch-socket is in no way intended to replace the various types of d.p. unit at present available, but that it is offered as a complete and shockproof alternative to the installation of a s.p. switch and a socket separately. The low price of the all-brown pattern makes it attractive even where competitive conditions might tempt the contractor to install a socket without any switch at all. A similar, but smaller, switch-socket, rated at 5 A, is also available.

Desk Lighting Fitting

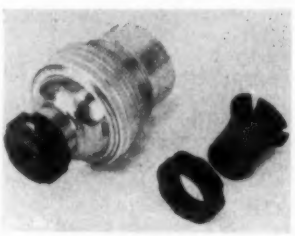
A recent addition to the range of "Typerlites" marketed by the "Typerlite" Co., 86, Cannon Street, E.C.4, is a novel form of standard designed to screw on to the back of any desk or table, thereby occupying very little space. Mounted on the vertical stem is a swing arm constructed on the usual lines of the company's products, with an adjustable and flexible end. The arm can be supplied in any desired length and swung from side to side over a range of 180 deg.; it can also be raised or lowered on the stem. The fitting is available with a metal reflector to take a 25- or 40-W lamp as desired.



"Typerlite" for desk fixing

A Simple Cord-grip

The "E.A." cord-grip recently introduced by MESSRS. C. H. PARSONS, LTD., Britannia Works, Tyseley, Birmingham, should appeal to contractors, wiremen, &c., as a time saver. The interior insulating piece, inserted in the lampholder top, is split and splayed at one end, so that when the exterior nut is tightened up the segments close and grip the flexible lead. A ceiling plate is also supplied by the company fitted with this cord-grip.

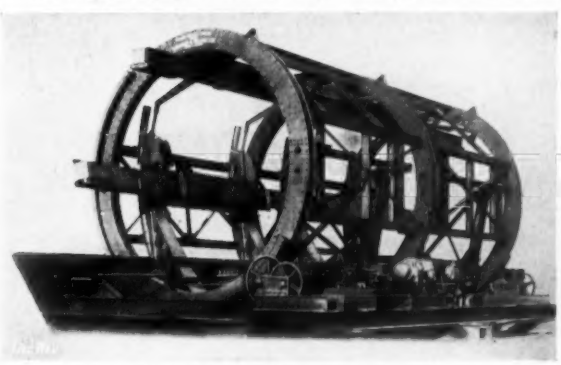


The "E.A." cord-grip

Electric Wagon Tippler

Satisfactory trials have just been completed on the new electric wagon tippler installed at the Pelaw Main Colliery by MESSRS. BABCOCK & WILCOX, LTD., Babcock House, Farringdon Street, E.C.4. The tippler is of the rotary type and is designed for the automatic clamping and discharging of two 10-ton railway wagons simultaneously. When the wagons are drawn into position the tippler can at once be rotated, as the holding of the wagons to the rails is done automatically during rotation by means of clamping bars and side buffers actuated by the gravity action of the tippling platform and pivoted cradle. The power required is obtained from a single 15-h.p. totally enclosed mining-type reversing motor, 770 r.p.m., one-hour rated, with a flameproof slip-ring cover, made by the Lancashire Dynamo & Motor Co., Ltd., and directly coupled to spur reduction gear. This gear operates the pinions engaging with the racks attached to the tippler rings.

The control equipment, made by Vlasto, Clark & Watson, Ltd., comprises a 15-h.p. drum-type reversing controller with six notches forward and reverse, suitable for series limit-switch operation in either direction. It has a triple-pole contactor type circuit breaker with a no-volt and three time-lag overload relays, and an ammeter. To ensure a definite limit of rotation in either direction, limit switches are incorporated in the driving gear and are tripped at the appropriate moment by a screw-operated trigger, thereby opening the circuit and bringing the tippler immediately to rest by a solenoid-operated brake. The cable throughout is p.i.l.c., d.w.a., suitable for 440-V, 40-cycle, 3-phase supply.



A B. & W. coal-wagon tippler

A New Radio Tester

The STANDARD BATTERY CO., 184, Shaftesbury Avenue, W.C.2, has sent us a sample of its latest meter, which users of radio apparatus should find very useful for universal testing purposes. This is of the polarised-magnet type. It is enclosed in a "Bakelite" case, is of small dimensions, and "stands up" on its base. The back of the case accommodates a small dry cell, making the instrument self-contained for checking circuits quickly. The scale is clearly marked in black and red as follows: 0 to 150 V, 0 to 6 V, 0 to 30 mA, and 0 to 2,000 ohms. Five sockets are provided to which contact is made by flexible connections and plugs. This meter should be of great utility for carrying out all kinds of tests upon radio receivers.

Wates "Stand-up" tester

Thoughts on Purchasing. By W. Gore Graham

With special reference to the small contractor

WISE purchasing may materially affect the trading account of the small contractor, and it is my aim to indicate how efficiency in this respect may be gained without the aid of a large staff or a skilled buyer.

In the first place it is necessary to differentiate between special buying for particular contracts and buying for stock purposes. It will be assumed that the contractor is not stocking for factoring purposes or even for his shop, if he boasts of one. As a commencement a list should be made of all the fittings and accessories which are required on the three standard jobs which are the most common, *i.e.* (*a*) carcase wiring, (*b*) finished house wiring, and (*c*) finished house wiring in c.t.s. It is necessary in the case of item (*a*) for the contractor to decide on the type of job on which he is going to standardise for all open tendering purposes, that is to say, slip, pin-grip or screwed conduit, or c.t.s.

Economy in Wiring Costs

While some architects specify lead cable in carcase work, it is on no account to be recommended as a standard job. If the supply authorities allow slip conduit and lug-grip fittings, this will be found to be the cheapest form for the usual type of modern housing estate work.

Perhaps it would be as well to say here that it pays to keep a wireman or wiremen on this type of work exclusively wherever possible, as constant practice at one type of work only, makes for very much quicker and cheaper labour. The only possible alternative to this method of carcase work is the use of c.t.s., and this may be a little cheaper in labour, but is more expensive in material, and for the purposes of this article we will assume that slip conduit is chosen, as the purchase of c.t.s., and its necessary accessories is covered by item (*c*).

Having decided on the use of slip conduit and lug-grip fittings, the local builders for whom we hope to work should be seen to ascertain what pet requirements they may have. It will be found that more often than not builders cling together in different localities, and nearly always specify a very similar installation in their several houses.

Help from Manufacturers

We will take it for granted that the contractor is standardising on certain types of accessories on all three items (*a*), (*b*), and (*c*), and that he has also a very shrewd idea of the amount of work which he will obtain in these classes of work.

Taking the branch switches first, let him decide on all details and then stick to it as regards the pattern, etc. Then he should write to all the reputable manufacturers or factors of these accessories and ask for tenders for supplying the estimated quantities over the given period—these quantities to be invoiced monthly at the agreed figure. It will be found that all manufacturers will readily agree to entering into this type of business, and it enables the contractor to avail himself of the bulk order discounts and at the same time relieves him of the necessity of carrying large stocks and tying up his capital.

Cable purchases come into rather a different category, as it behoves every contractor of repute to use the best cable, and it is specified in 99 per cent. of the work that "Ring" or C.M.A. cable shall be used. He should take every advantage he can by signing any special rebate agreements which the cable firms offer.

There is one very important point that I would lay great stress on, to wit—never be too busy to see a traveller. It is common practice for the manager or the contractor to glance at the traveller's card and then announce that he has "nothing to-day." This is fatal to the man who is out to save the last penny.

"Speciality" Purchasing

Speciality purchasing differs in a rather pronounced fashion from the routine purchases made for stock. By "speciality" I mean such purchases as are necessary for a contract which has been put out to tender by an architect, and is bound to specify not only the actual type of accessories to be used, but even the make.

It is frequently the case that the following method of purchasing will have been adopted at the time of tendering. Whether this is the case or not, it will be found that it meets with better results if the order is being actually placed, than if it is a case of inquiry only. Let us take by way of an example the case of the contractor who is successful in obtaining the contract for a public building, the contract price being in the neighbourhood of £500.

Such a job will call for a considerable quantity of i.c. fusegear, etc., which is not as a rule kept in stock, and the contractor would therefore appear to have to content himself with the standard net prices as offered in the suppliers' catalogue, if it were not for a rather important and very much overlooked point, *i.e.*, that nearly all the material required for the contract could be obtained from one of the really large factors, whereas the contractor could not place a bulk order for a quantity of one type of accessory, he could place a very large order for an assorted list of components, and any firm of repute will meet the contractor in granting him a very useful rebate on the strength of such an order.

It is little things like this that spell profit. Another strong point in connection with such a method of purchasing is that the carriage (which might total as much as five pounds, if the job is situated some twenty miles from London) is no longer to be considered, as the factor will give free delivery on anything over about ten pounds or so in value. It would be interesting to see just how much profit goes, through indiscriminate purchasing leading to a multitude of small rail and carrier charges.

Most contractors, however small, run a van or car, and this is again a method of saving delivery charges, if there is co-ordination between the different sections of the little business. By this is meant the fact that the car is probably going up to town on some sort of business and it will be found that there is something which was being ordered to be sent down by mail or train, and could easily be brought back in the car.

Stocking a Showroom

We now come to the special types of buying which appear when the contractor runs his own showroom or shop. He should decide in the first place whether he is going to factor accessories to smaller electricians in his neighbourhood, or whether he is going to cater entirely for the buying public. I am supposing that it is the latter, as the points already emphasised above amply cover the purchasing of such goods as he might factor.

Now, if the contractor has the electrical side of his business really fully developed he will be inclined to stock his showroom with fittings, domestic appliances, etc., rather than display an assortment of torch batteries, torches, and similar articles. Such a display mixed up with an electric fire or two looks very cheap and is not likely to attract the public.

However, I am not dealing with advertising or window dressing in this article, so I will content myself by showing how an effective display may be made without the outlay of a great deal of capital.

In the first place, there are many firms who have really wonderful displays of their own fittings in their London showrooms, and these firms are always very willing to do all they can, and to go out of their way to help the small man stock his new showroom. A favourite offer of theirs is to let the contractor select, say, £100 worth of fittings and let him have them on a three months' credit basis, at the end of which time he can return up to say 60 per cent. of the value, sometimes even more.

Alternatively, some of the better known manufacturers of fires and accessories will undertake to provide a window display for a time. Surely it is better to operate the showroom in such a manner, than by tying up a great deal of capital in a stock of fittings which cannot be representative, and are therefore quite likely to remain unsold for years.

Go and See the Wholesaler

A certain amount of money must be tied up in such universal things as lamps, electric irons, and a very few plain glass or china shades, but it must be remembered that to avoid an immense amount of tied-up capital it is necessary to really get down to hard facts with the wholesalers—go up to London and see them, tell them that there is no other decent showroom within fifteen miles, and that it will be as much to their benefit as to your own if they will help you to show a modern continually changing display of everything electrical.

Finally let me stress the importance of ascertaining the local supply company's requirements before purchasing. It is quite easy to lay in a stock of one or other of the many combined switch-fuses, to be used as a standard main control in small six- or seven-point houses and then find that the company won't allow that type.

I quote this example because I have come across such a case. Beware also of some of the patent accessories which are on the market now; they may be cheap and take one's fancy, but they do not comply with H.O. regulations, and while one may get away with it for some time, it is possible that one may get caught out in a specification containing the paragraph: "The whole installation shall comply with the I.E.E. Regulations, H.O. Rules, and the requirements of the local supply authority and the fire office concerned. . . ."

The Indian Electrical Market

Mr. T. M. Ainscough's Report

THE annual report of Mr. T. M. Ainscough, H.M. Senior Trade Commissioner in India and Ceylon, has recently been issued by the Department of Overseas Trade (price 3s. 6d. net). It covers the financial year 1930-31, and has been revised to August last and states that so far as electrical machinery and plant are concerned, imports had not been affected at the time of the report either by the economic crisis or by the political agitation. The British percentage was maintained at 76. The orders which have been received during the past few years for railway electrification schemes and hydro-electric projects are nearing completion, and the disinclination of the Indian Government to embark on large capital works in these times of financial stringency will probably create a temporary lull in activity for the next year or two.

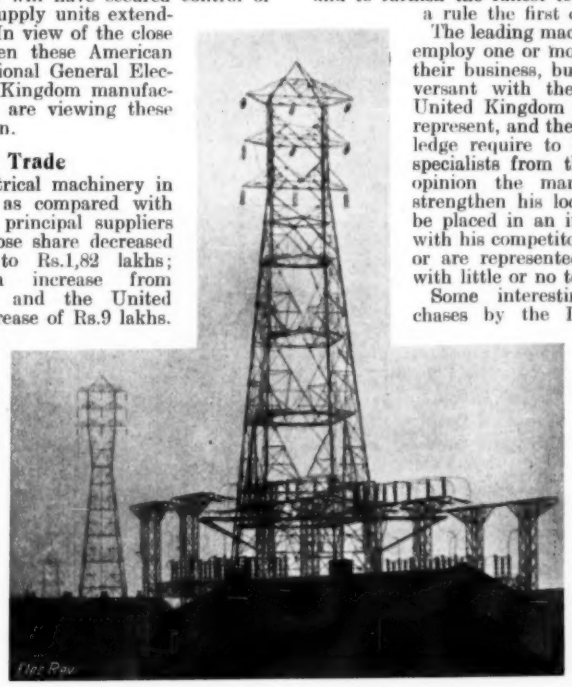
Mr. Ainscough considers it likely that there will be also a reduced demand from private power companies for similar reasons of finance. Mention is made of the activities of American financiers through an Indian company which has been formed for the purpose, in obtaining a controlling interest in power supply undertakings in Western India. The Poona undertaking has been purchased, the control of that at Karachi has also been acquired, and one or two other interests are threatened.

An allied group of American financial interests now share with the Tata Co. the managing agency of the powerful Tata Hydro-electric Group of companies which supply the bulk of the power to the Bombay mills. It appears therefore that, before long, American interests will have secured control of the whole chain of important supply units extending from Bombay to Karachi. In view of the close connections which exist between these American *entrepreneurs* and the International General Electric Co. of New York, United Kingdom manufacturers' representatives in India are viewing these developments with some concern.

Electrical Import Trade

The value of imports of electrical machinery in 1930-31 totalled Rs.2,39 lakhs, as compared with Rs.2,40 lakhs in 1929-30. The principal suppliers were the United Kingdom, whose share decreased slightly from Rs.1,83 lakhs to Rs.1,82 lakhs; Germany, who showed an increase from Rs.16 lakhs to Rs.17 lakhs; and the United States with Rs.29 lakhs, an increase of Rs.9 lakhs.

With regard to electrical apparatus the total trade declined from Rs.3,61 to Rs.3,11 lakhs, the United Kingdom's share being reduced from Rs.2,15 to Rs.1,74 lakhs. The principal classes were telegraph and telephone instruments, the value of which fell from Rs.1,15 lakhs in 1929-30 to Rs.1,05 lakhs in the year under review, electric lamps and parts (from Rs.65 to 59 lakhs) and electric fans and parts (from Rs.40 to 26 lakhs). The chief supplying countries were the United Kingdom (Rs.1,74 lakhs), United States (Rs.44 lakhs), Germany (Rs.43 lakhs), Netherlands (Rs.15 lakhs), and Italy (Rs.9 lakhs).



The Grid at Yarmouth

Government Purchasing Methods

Sections of the report are devoted to the altered methods of purchasing Government stores and railway material. It is satisfactory to note that United Kingdom suppliers are meeting the changed situation created by the inauguration of the rupee tender system by opening branch offices and service organisations, floating separate limited liability companies in India, and in other suitable ways.

With regard to the rumours that the Indian Stores Department is likely to come under the retrenchment scheme, Mr. Ainscough believes that, so far from being abolished, it will emerge from the crisis with extended scope. Among other purchasing which it has taken over in recent months are electrical machinery fittings and cables. In 1930-31 it bought electric lamps, fans and fittings, Rs.14,76 lakhs; electric cables, Rs.10,77 lakhs; and generating and converting plant and prime movers, Rs.8,91 lakhs.

In connection with the new policy governing the purchase of stores there is another factor which is disturbing to British manufacturers. This is the cutting of prices, and consequently the lowering of quality which are associated with the encouragement of local makers. In the Stores rules there is actually employed the term "quality sufficiently good for the purpose." It is easy to understand that this attitude neutralises the goodwill resulting from long years of association with India's particular requirements and reduces all considerations to one dead level of cheapness, thereby penalising the specialist contractor and opening the door wide to any foreign firm which may be on the Department's list and may be prepared to cut in. In all the circumstances it is a relief to read Mr. Ainscough's final comment in this connection that on the whole the rupee tender system may be said to have so far worked without imposing undue strain or hardship to United Kingdom suppliers.

British Engineering Representation

It is said that with few exceptions United Kingdom machinery manufacturers are adequately represented in the Indian market. The tendency for many years has been either to operate branches of their own, staffed with trained engineers and erectors, or to attach an expert to the staff of their mercantile agents. One or other of these methods is almost imperative if the Indian business is to be adequately dealt with and provided that the turnover warrants the expense. The Indian industrialist is now branching out into many highly complex industries and is determined to have the most highly scientific advice and to purchase the latest and most improved types of plant which are obtainable. There are, however, scarcely any firms of consulting engineers available. The trained managers of the branch offices of United Kingdom engineering and machinery firms have, in the past, filled this gap and have rendered, gratuitously, invaluable services to Indian industrialists. This help, Mr. Ainscough says, will be required more than ever in the future. The manufacturer who is prepared to advise his client on the spot as to the layout of a scheme, to draw up specifications, and to furnish the fullest technical information, will have as a rule the first call on an order.

The leading machinery merchants in India usually employ one or more trained engineers to look after their business, but these men cannot be fully conversant with the productions of all the leading United Kingdom manufacturing firms which they represent, and their general services and local knowledge require to be reinforced by the services of specialists from the works. In Mr. Ainscough's opinion the manufacturer who is prepared to strengthen his local organisation in this way will be placed in an impregnable position as compared with his competitors, who either remain in England or are represented in India by mercantile agents with little or no technical knowledge.

Some interesting figures regarding the purchases by the Indian Railways of electric plant in 1929-30 compared with the previous year are given. The total value fell from Rs.3,64 crores in 1928-29 to Rs.2,16 crores in 1929-30, and of this figure, Rs.1,22 crores represented direct purchases, Rs.0.90 crores purchases through agents in India, the total of imported material being Rs.2,12 crores and the value of indigenous materials Rs.0,04 crores, making up the balance.

The Tariff Board recently held an inquiry into an application for protection to the manufacture of electric wires and cables other than paper-insulated cables. The report says that this inquiry is completed but it does not state the result. Our Indian correspondent reports, however, that the Committee considers that no protection should be granted and the Government has accepted its findings.

Orders for Hydro-electric Material

In the course of a brief review of hydro-electric developments it is reported that in the Pykara (Madras) scheme, the majority of the equipment, including gates, valves, pipe line, generators, transformers, switchgear, transmission line and sub-station material, will be of British manufacture. In value about 70 per cent. of the orders placed went to England and the rest to foreign countries.

It is expected, judging by progress so far made, that the scheme will be completed by the scheduled time—the end of 1932—and within the estimated cost. At the outset power is expected to be distributed mainly in the Coimbatore district. The proposed rates for power are attractive and the advantages of the district, such as climate, cheap labour, good water supply and railway communications, cheap factory sites, &c., should appeal to industrialists wishing to establish factories in the district.

Openings in Ceylon

The Director of Electrical Undertakings to the Government of Ceylon has supplied the Trade Commissioner with a brief summary of progress in 1930-31. From this it appears that there is a good prospect for the electrical trade, particularly for lighting, both in Colombo and in small towns near Colombo.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Easter Holidays

The ELECTRICAL REVIEW for March 25th will be published on the morning of March 24th owing to the following day being Good Friday. Our Advertisement Department announces that it will require new copy (with blocks) by Wednesday, March 16th. Official notices and small pre-paid advertisements will be received up to 5 p.m., March 21st. For the April 1st issue new copy must be received by March 21st.

A Permanent Building Exhibition

The establishment in Bond Street, London, of a permanent building exhibition where it will be possible to make comprehensive and continually changing displays of the most up-to-date equipment for houses, &c., is announced this week by the Building Centre, Ltd. The Architects' Building Centre, as it is called, is supported by the Councils of the Royal Institute of British Architects, the Architectural Association, and various official departments, leading architects, contractors, trade associations and manufacturers; the British Electrical Development Association is organising the electrical section, which will cover wiring systems, lighting, heating, cooking, refrigeration, power, bells and telephones, radio and other domestic applications. Many of these will be demonstrated in one department of the Centre, while others will be found occupying appropriate places in the model rooms and in other parts of the building. It is hoped to open the Centre at the beginning of June, and already about 300 manufacturers in various industries have applied for space. If the venture is a success it is proposed to establish similar Centres in other parts of the country.

The E.D.A. (Northern Counties Area)

The annual general meeting of the Northern Counties Area of the British Electrical Development Association will be held on March 31st at 2.15 p.m. at the Central Station Hotel, Newcastle-upon-Tyne. The meeting will be preceded by a luncheon (12.45 for 1 p.m.) at which the principal speakers will be Mr. Ll. B. Atkinson and Mr. A. C. Cramb, Mr. E. L. Beck being in the chair. Tickets for the luncheon (4s. each) can be obtained from Mr. A. Parkin, the Area Officer, Commercial Union Buildings, Pilgrim Street, Newcastle-upon-Tyne.

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Static Electric, Ltd., Manchester.
Albeson, Middleton, Manchester.
Marshall, F., Leamore, Walsall.
Madge & Son, Plymouth.
Poile, W., Southborough.
Topping & Cooper, Middleton, Manchester.
Lock, G., Thames Ditton.
Langton & Young, Rainham, Kent.

At the same meeting one application was withdrawn and six were declined.

New Showrooms for Redcar

Councillor W. Morris, chairman of the Redcar Electricity Committee, on March 2nd formally opened new electricity showrooms at Ridley House, a mansion in the centre of the town recently acquired by the Corporation. In a brief review of the seven and a half years of progress since the electricity undertaking was started, Councillor Morris stated that they started with fewer than 100 premises connected; now they had 4,000 consumers, and the number was steadily growing. He paid a tribute to the work of the electrical engineer, Mr. J. A. O'Brien.

Electrical Exhibition at Southend

The Southend-on-Sea Electricity Department is holding an electrical exhibition at the Pier Pavilion from March 14th to 19th. Demonstrations of electric cooking and short talks on domestic subjects have been arranged, and will be supported by cinema films.

Patent Law Suit Result

We learn from Messrs. Philips Lamps, Ltd., that an action for infringement of patents was recently brought against them by the Hyalos Company. The claim was for approximately £165 at par for each day since July, 1923, on which Philips's had manufactured glass tubes and rods by methods stated to be covered by patents held by Hyalos. We understand that the claim was dismissed both in Holland and in France. The Supreme Court of Holland on March 4th confirmed the decision of the Court of Appeal at the Hague, permitting Philips Lamps, Ltd., to continue manufacturing by this method. The Paris Court of Appeal gave a similar judgment early this week. It was held that the patents were invalid because the contents had been published before filing.

Approval of Electrical Goods in Canada

The Department of Overseas Trade has issued a collection of notes prepared by H.M. Senior Trade Commissioner in Canada on the present position with regard to the approval, prior to sale in Canada, of electrical appliances. In 1927, after preliminary work begun seven years earlier, the Canadian Electrical Code, Part I, comprising the "essential requirements and minimum standards governing electrical installations of buildings, structures, and premises," published by the Canadian Engineering Standards Association, made its appearance. A second edition was published in 1930, and there will probably be another in 1933. This Code has no Dominion status, but it has been adopted by all the provinces with the exception of Prince Edward Island and Manitoba; in Manitoba the city of Winnipeg also requires the approval of electrical apparatus, and the Western Canada Insurance Underwriters' Association does likewise throughout the remainder of the province, although the latter body has no legal powers behind it. Where the provincial authorities have taken official action regarding the adoption of the Code, the use of unapproved electrical equipment is unlawful. In Ontario the Code has been adopted by the Hydro-Electric Power Commission as its own rules and regulations. In actual practice laboratory approval as at present being carried out is in general restricted to such equipment as is used by the general public in domestic, commercial, and industrial installations. Information as to the procedure necessary in order to have electrical equipment approved for Canada, and as to fees charged, etc., may be obtained from the Approvals Laboratory of the H.E.P. Commission, 8, Strachan Avenue, Toronto, 2, Canada.

"Revo" Traffic Signals

The Revo Electric Co., Ltd., continues to develop its traffic signal apparatus and has recently introduced a number of improvements. A new two-piece lens unit is now employed which gives greater brilliance, purity and evenness and enables the signal to be seen through a wider zone. The new lens is also smooth back and front, thus remaining clean for longer periods. The controller has also been simplified and improved. The contacts can be removed by an unskilled person in a few minutes without interference with the wiring or mechanism. As a result of these improvements manufacturing costs have been reduced enabling the prices to be lowered.

The "Revo" traffic signal demonstration van

The "Revo" system has been installed in thirty cities and towns and to encourage extension of its use, the company has equipped a demonstration van which is in charge of a qualified engineer. This is illustrated above.

The company informs us it was responsible for the whole of the lighting equipment in the picture which appeared in p. 345 of our last issue, but that the traffic signals were not "Revo" apparatus.

Large Electric Windlasses

The windlasses on the turbo-electric P. & O. liners, *Strathnaver* and *Strathaird*, recently placed in commission between London, Bombay and Australia, have to deal with cables of 3 5/16 in. diameter. Each windlass is worm-gear driven by two 100-h.p. motors mounted on the same bedplate. Warping ends, 30 in. diameter, are fitted to the main shaft for slow warping, and powerful screw-band brakes control the veering of the cables. All the windlass gearing is of cast steel; the bedplate-centre stands, side frames, and cable holders are of semi-steel. All bearings are gun-metal bushed. The windlass drives two warping capstans through bevel gearing with machine-cut teeth. The foolproof control gear is of the Clarke, Chapman "Ward-Leonard" booster type, which gives load protection similar to that of the steam windlass and avoids creating peaks on the supply system. Similar

A novel window display at the Electrolux headquarters

equipments have been provided for many recent vessels, of which the most outstanding is the cable-lifting capstan gear supplied to the m.v. *Georgia*, the cables of which have a diameter of 3 7/16 in. An illustration of one of the windlasses appears on page 385.

German Electrical Imports and Exports

The official returns just to hand show that the imports of electrical machinery and apparatus into Germany during December last reached a total of £140,950, bringing up the aggregate imports during the whole of the past year to £1,834,250, as compared with £2,181,800 in 1930. The exports of similar material from Germany are returned at £2,214,150 for December last and £24,416,150 for the twelve months, the latter figure comparing with £28,670,750 in the preceding year. The import total was made up of £335,200 of electrical machinery, and parts and apparatus to the value of £1,499,050. The respective figures for the exports were £4,430,950 and £19,985,200.

Marking of Portable Lamp Casings

The Standing Committee appointed by the Board of Trade under the Merchandise Marks Act will hold an inquiry on April 18th and 19th into the question of marking imported casings for dry or secondary battery portable electric lamps, lanterns, and torches. The inquiry will be held at the Board of Trade Offices, Great George Street, S.W.1. Communications should be addressed to the secretary, Mr. E. W. Reardon, at that address.

Ceylon Tariff Increases

According to the *Board of Trade Journal*, the following new duties on imports into Ceylon came into force on February 6th:—Accumulators (except "splash-proof" accumulators), batteries, convertors, and transformers, control and switchgear, 10 per cent. *ad valorem*; and electrical machinery, 15 per cent. *ad valorem*.

American Sales Tax Bill

The Sales Tax Bill, proposing a levy of two per cent. on practically every article manufactured in the country and estimated to produce $625,000,000 for the United States Treasury, has been adopted by the House of Representatives Ways and Means Committee. It is expected that special excises will be levied on electrical energy, illuminating gas and oil imports.—*Reuter* (Washington).

Irish Free State Electrical Imports

A very quiet tone continues to exist in the electrical trade in the Irish Free State, the imports of machinery and cognate apparatus during December last having amounted to a value of only £75,431, bringing the total for the whole of the past year to £692,524, a decrease of £230,141, or nearly 25 per cent., as compared with 1930. Details of last year's imports are appended:—

	1930. £	1931. £
Electrical machinery	287,603	181,464
Electric wires and cables	164,814	99,584
Electric lamps and parts	99,782	59,682
Radio sets and parts	106,484	132,575
Other electrical goods	226,274	202,052
Copper wire	47,308	17,167
Totals	£922,665	£692,524

Hungarian Washing Machine Duties

According to the *Board of Trade Journal*, the duties for the importation of domestic electric washing machines and parts have been increased from 150 or 200 kr. to 200 kr. per 100 kg. for machines weighing 15 kg. or more, and from 200 to 800 kr. for machines less than 15 kg. in weight.

A Peruvian Lamp Company

A new company has lately been formed in Lima with the title of the Sociedad Fabrica de Lamparas Electricos Dira for the purpose of manufacturing electric lamps in Peru.

Swiss Electrical Exports

The appended table shows the value of the exports of electrical machinery, apparatus, and cognate goods from Switzerland during last year as compared with 1930. It will be seen that except for slight increases in the case of accumulators and insulators, all the items show a decline, the gross decrease for 1931 amounting to £898,600, or over 25 per cent. as compared with the preceding year.

	1930. £	1931. £
Electrical machinery	1,495,240	1,060,080
Electric locomotives	105,080	25,200
Electric apparatus and instruments	1,576,440	1,246,040
Telephonic and radio apparatus	79,480	47,320
Incandescent lamps	166,080	138,640
Copper cables	72,880	44,220
Electrodes	33,520	37,720
Accumulators	31,380	37,500
Porcelain insulators	20,820	15,600
Totals	£3,580,920	£2,682,320

Lloyd's Import Duties List

A very concise and complete statement of the present position with regard to British import duties is contained in *Lloyd's Import Duties List, No. 2*, published by the Corporation of Lloyd's, E.C.3 (price 6d.). A well-set-out index facilitates reference.

Youth and Industry

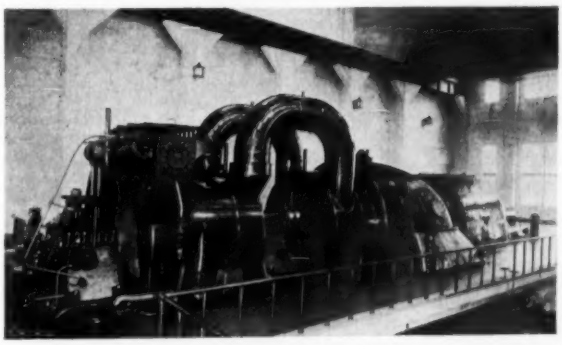
The sixth and final conference of the winter session, arranged by the Northern Counties Area E.D.A. Committee, was held on March 3rd at Sopwith's Lounge, Northumberland Street, Newcastle, when an audience numbering 120 listened to an inspiring talk on "Youth and the Industry," by Mr. A. Albrecht, director of the Electrical Wholesalers' Federation. Mr. A. W. Bacon, of Messrs. C. A. Parsons, presided. There was a very good discussion at which members from all parts of the area took part.

The Cables and Wireless Building

Cables and Wireless, Ltd., announces it has decided not to proceed further with the plan for the occupation of the new headquarters on the Victoria Embankment. This decision has been taken owing to the adverse effect of the world crisis on the revenues of its associated company, Imperial and International Communications, Ltd., which has inevitably entailed a drastic readjustment of arrangements. The building is to be put up for sale.

Large B.T.H. Sets for Japan

When, in 1927, the Imperial Government Railways of Japan, decided to erect their own power station to serve the electrified lines an order for two 20,000-kW turbo-alternator sets was placed with the British Thomson-Houston Co., Ltd. One of these sets is illustrated herewith. It is capable of sustaining an overload of 25,000 kW, a peak load of 30,000 kW, and a momentary overload up to 40,000 kW. The turbine, which is of the two-cylinder type, has 25 stages and is designed for normal steam conditions of 25 kg. per sq. cm. and a total temperature of 375 deg. C. at the stop valve. The normal vacuum is about 722 mm. at 25,000 kW. Stainless steel is used for all blading. The turbine is arranged with three branches for the extraction of steam for boiler feed-water heating purposes. Initially the plant is being operated with two-stage feed heating, giving a final feed temperature of 99 deg. C. at 20,000 kW, the third point being only used in connection with the evaporator. Later on the feed heating plant may be rearranged with a third stage heater to give, in conjunction with the other heaters, a final feed temperature of 150 deg. C. at 20,000 kW.



B.T.-H. turbo set for the Japanese Government Railways

The alternator is wound for 3-phase, 50 cycles, 6,600 V, 90 per cent. power factor, and is equipped with a directly coupled cascade-type exciter. A closed circuit system of ventilation is employed, the circulating water being obtained from the condenser supply. A motor-generator standby exciter set has also been provided. The equipment includes contactor-type starting gear, and the main and exciter field rheostats are arranged for motor operation.

Ex-Verity Association

The annual smoking concert of the Ex-Verity Association will be held at the Great Central Hotel, Marylebone Road, on March 18th. Particulars may be obtained from the honorary secretary, Mr. W. M. Tribute, c/o Messrs. Hoover, Ltd., Perivale, Middlesex.

Holophane Colour-lighting Demonstration

On March 2nd a large number of members of the Electrical Association for Women, as well as several prominent persons connected with the electrical and cinematograph industries, visited the Holophane demonstration theatre at Elverton Street, Westminster. Mr. H. Hepworth Thompson, managing director of Holophane, Ltd., welcomed the members, and demonstrations of colour lighting were given in a most interesting and lucid manner by Mr. Gillespie Williams, chief colour consultant to the company. The effects of changing scenery by means of lighting were enhanced by the assistance of the Mayfair School of Dancing, one of whose members is shown in the attractive setting illustrated on page 383. Mrs. Cole, in proposing a vote of thanks to the company, expressed the wish of all the members present that luminous colour might be more extensively used for beautifying the home.

Social Events

There was an attendance of 500 at the annual staff dinner of W. T. Henley's Telegraph Works Co., Ltd., and Henley's Tyre & Rubber Co., Ltd., which was held at the Great Central Hotel, St. Marylebone, on Saturday last. Mr. W. J. Potter was in the chair and the toast of "The Companies" was proposed by Mr. S. J. Madden (Tyre Co.), who urged those present not to sit down amid the "economic blizzard" but to make an extra effort on behalf of their companies to assist them in these difficult times. He made a special appeal to the younger members of the staff to uphold and continue the fine traditions of Henley's. The chairman in his response to the toast mentioned that he was retiring from his present post at the end of the month. He was, however, remaining on the board and would thus continue his association with the company. Mr. W. G. Smale (Tyre Co.), who also replied, mentioned how the Tyre Co. had surmounted its difficulties.

Sir George Sutton, Bt. (chairman of Henley's) asked the company to drink the health of Mr. Potter, who for forty-five years had been a member of the staff and whose courtesy, even temper and justice had endeared him to them all. Mr. Potter made a brief acknowledgment and thus wound up the very short speech list. The company then adjourned to the Winter Garden of the hotel and under the direction of Mr. H. Stanley (who had earlier acted as toastmaster) danced until midnight, Evelyn Hardy's Ladies' Band providing the music.

The sixth annual sports of the Indian Cable Co., Ltd., were held on the company's recreation ground, Tatanagar, on February 13th. The usual track and field events constituted a long afternoon's programme which was carried out in the glare of a tropical sun. The various events were evidence of the good sportsmanship that is rapidly becoming a feature of the East. The tug-of-war provided considerable excitement and amusement was created by the obstacle race. The prizes were presented by Mr. P. White, the winner of the championship cup presented by Mr. F. W. Leake being M. M. Pillay.

The A.T.M. Sports and Social Organisation held its annual dance at the Grafton Rooms, Liverpool, on February 29th. There was an attendance of some 700, the guests being received by Mr. J. Nixon, director and works manager. Among the visitors were the Lord Mayor of Liverpool, Alderman J. C. Cross, and the Lady Mayoress, the Mayor of Bootle, Councillor A. Hankey, J.P., himself a member of the Strowger Works organisation, the Mayoress of Bootle, the town clerk of Bootle, and Mr. Percy Corkhill. A novel feature was the control of dancing from the bandstand by one of the company's street traffic signals, the "Stop" and "Go" being operated by the leader of the orchestra. Our illustration on page 381 shows the Lord Mayor announcing his own arrival by pressing a pedestrian control button.

On February 29th, the Metropolitan-Vickers Electrical Co.'s Long Service Association held its tenth annual meeting. After an enjoyable supper Mr. G. E. Bailey, director, proposed that Sir Felix Pole should be elected president, and this was seconded by Mr. T. G. Morris. Sir Felix thanked them for the honour, and said that he appreciated the fine work the Association was doing in the company's service, and he would do all in his power to assist. The Trafford Park works were the largest in Lancashire, and they had to add to that the capacities of their associated companies.

The Metropolitan-Vickers Electrical Co., Ltd., is holding its annual dinner and dance next Friday (March 18th) at the Beta Café, Soho Square, W.C.2.

The Manchester Magnet Amateur Dramatic Society on February 26th presented the farcical comedy, "The Unfair Sex," by Eric Hudson, at the Lesser Free Trade Hall, Manchester.

At the Streatham Hall, London, on February 27th the G.E.C. Dramatic Society, in a performance entitled "In the Tunnel," by Jordan, was one of four societies from 48 entries in the preliminary London festivals held in connection with the National Festival of Community Drama, to be chosen by the adjudicator, Mr. Robert Newton, to go forward to a final performance for London and Middlesex societies.

The 25th annual staff dinner of the Northmet Co. was held at the Café Royal, London, W., last Tuesday. The toast of "The Northmet Company" was proposed by Sir Ernest Clark, K.C.B., who said the members of the staff were fortunate in having permanency of employment, scope for promotion, interesting work, and a good leader. In responding, Lord Ashfield (chairman) said that last year the company had sold 260 million kWh to 86,000 consumers. Its ambition was to supply electricity to every inhabitant and every factory within its area at as low a price as possible. Captain J. M. Donaldson, M.C., proposing "The Guests," stated that there were 56 local authorities in the company's area. Referring to the consumers represented, he credited the Ediswan Co. with being the earliest power consumer (from 1906). Mr. A. Horne-Morton responded in a humorous speech. The health of "The Chairman" was proposed by Mr. C. J. Barnett and seconded by Mr. C. G. Tegetmeier. The function concluded with a cabaret show.

Recent Contracts

Siemens Electric Lamps & Supplies, Ltd., have received a contract from the Belfast City Tramways for twelve months' supply of traction-type and standard lighting lamps.

The Southern Railway Co. has placed an order with Messrs. Crossley Brothers, Ltd., for two sets of four-cylinder vertical Diesel engines, each direct coupled to a 100-kW dynamo for the new graving dock at Southampton. Other contracts placed with Messrs. Crossley Bros., Ltd., are for four sets of six-cylinder vertical Diesel engines for dynamo driving at the British Broadcasting Corporation's West Regional station at Watchet; four similar engines for Falkirk broadcasting station; and a five-cylinder vertical Diesel engine with 100-kW alternator for Broadcasting House, London.

Messrs. E. J. Walsh & Co., of Edinburgh, have recently received orders for poles and other tramway equipment from Edinburgh, South Shields, Southampton, St. Helens and Colne Corporations; also from Bath Electric Tramways, Ltd., South Lancashire Transport Co., and Shropshire, Worcestershire and Staffordshire Electric Power Co. In our last issue we reported that the South Shields Corporation had purchased six tramcars from the Wigan Town Council. We learn, however, that this was not quite correct, as Messrs. E. J. Walsh purchased the whole of the Wigan Corporation tramways, and sold to the South Shields Corporation six of the tramcars.

We are informed by the Associated Equipment Co., Ltd., that the chassis for the trolley-buses for the Southend Corporation and the Notts and Derby Traction Co., orders for which were recently placed with the English Electric Co., Ltd., are of A.E.C. manufacture.

For Sale

A stock of sound film apparatus will be sold by auction on March 16th, 17th and 23rd.

Mr. Henry J. Shaw is to sell by auction on March 16th and 17th trade stocks of radio and electrical goods, &c.

(See our advertisement pages to-day.)

Prices of Materials

Messrs. F. Smith & Co. report, March 9th: Electrolytic copper l.c. wire, 6 5/8d., 1/8d. inc. Silicium bronze wire, no change.

Messrs. Edward Till & Co. report, March 9th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, March 9th: Copper bars (best selected), sheet and rod, £66, £2 decrease. English pig lead, £15, 15s. increase.

The Timber Trade

Our Timber Trade Correspondent reports that there has been a little more activity in the market for European building woods compared with January. Supplies of British and foreign woods are ample to meet present demands. The ten per cent. tax on timber will hit the American section of the wood trade severely, and it would be well for cabinet and other manufacturers to give more attention to Empire hardwoods, as they are not dutiable. Mahogany is a little firmer, yet still comparatively cheap, all things considered. Large shipments of plywood have been rushed forward to escape the tariff and, as the demand is only moderate, users are advised to replenish stocks early, as later it seems certain that they will have to pay higher prices.

New Catalogues and Lists

Baxter & Caunter, Ltd., 221, Tottenham Court Road, W.1.—The March issue of the company's electrical accessories and plant catalogue.

English Electric Co., Ltd., Stafford.—A number of new publications on fractional h.p. motors, oil-immersed rotor starters, interconnected-star balancers and induction regulators, metal-clad compound-filled switchgear, and power factor improvement.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Four publications relating respectively to heavy-type push-buttons (leaflet No. 450/116), brake solenoids (No. 1720), overload switches for small motors (No. 6751), and accessories for use with "Igranic" controlling devices (No. 450).

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—An illustrated leaflet on metal-clad oil circuit-breakers.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Several new pamphlets for insertion in the "Reyrolle" and "Holmes" general catalogues. The subjects covered include switchgear, protective gear, plugs, dividing boxes, distribution gear, squirrel cage induction motors, and a.c. motors for collieries.

Mavor & Coulson, Ltd., 47, Broad Street, Glasgow.—A calendar-blotter for March with illustrations of the "M. & C. Ritchie" trough joints.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—March catalogue of surplus new and second-hand electrical material.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C.2.—Leaflet No. 1139, dealing with the type S.B.4a 75-W short wave "tank" set.

Jackson Electric Stove Co., Ltd., 143, Sloane Square, S.W.1.—A calendar-blotter for March portraying one of the company's water heaters.

Brown Brothers, Ltd., Great Eastern Street, E.C.2.—Particulars of "Baker's" soldering fluid and "Solderine" paste flux.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—An illustrated folder relating to Henley unit-type distribution pillars.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham.—An abridged price list of electrical fittings and accessories.

Donovan & Co., 46, Great Charles Street, Birmingham.—Publication No. 3212, describing the company's starters for a.c. single-phase motors.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—The March issue of "The Link," containing particulars of two new models of electric iron. Also a folder (No. 1128) on the "Universal" floor polisher.

Bankruptcy Proceedings

H. H. Buckler, electrical contractor, 3, The Arcade, Hitchin, Herts.—The receiving order was made on January 21st on the debtor's own petition, and the first meeting of creditors was held recently at the Chamber of Commerce Room, Luton. According to the statement of affairs submitted there were liabilities amounting to £1,646 against assets of £443, leaving a deficiency of £1,203. The following are the principal creditors:—Edison Swan Electric Co., £77; General Electric Co., Ltd., £210; Lighting Trades, Ltd., £90; and W. Watts, £80.

C. Woodhead (Woodhead Partners), electrical engineer, Angel Buildings, Angel Yard, Briggate, Leeds.—First meeting held March 10th. Public examination April 5th at the County Court House, Albion Place, Leeds.

E. F. Lee (carrying on business as Francis Newton), electrical engineer, 340A, Kings Road, Chelsea, S.W.—Trustee, Mr. E. Parke, Bankruptcy Buildings, Carey Street, W.C., Official Receiver, released February 15th.

W. L. Cornish (Modbury Electric Light & Power Co.), electrician, 5, Church Street, Modbury, Devon.—Receiving order made March 1st on debtor's own petition.

Company Liquidations

Dennis Manufacturing Co., Ltd., wireless manufacturers, Bath Street, E.C.—A meeting of creditors was held recently at the Institute of Chartered Accountants, London. No statement of affairs was submited, but it was reported that the liabilities to creditors amounted to £3,468 and the assets to £4,542. The nominal capital of the company was £1,000, but only 11 shares of £1 each had been issued and they had never been paid for. A resolution was passed in favour of the appointment of Mr. Hole, of Messrs. Bradley, Hole & Co., 240, High Holborn, W.C., and Mr. Sharp, the company's nominee, as joint liquidators, together with a committee of inspection.

Mersey Electrics, Ltd.—Winding up voluntarily. Liquidator, Mr. A. K. Jones, 43, Regent Street, Wrexham.

Private Arrangements

Essex Radio Supplies, Ltd., wholesale wireless dealers, Bishopsgate, E.C.—A meeting of creditors was held on March 4th, when the representative of the Telsen Electric Co., the principal creditors, presiding. The chairman said that a general meeting was held on February 24th, when a resolution for voluntary liquidation was passed. The validity of the resolution had, however, been contested. Petitions had been presented against the company and a special manager had been appointed. Mr. L. Fior said that some substantial creditors would prefer voluntary liquidation to take place, as they feared that a compulsory winding up would mean delay. He said that a meeting of the creditors had been called for the previous day to submit an offer of 4s. or 5s. in the £, but was cancelled. It was understood that the liabilities were about £45,000, while the assets included stock of about £22,000, which would probably realise something like £7,000, and the estate would therefore show approximately 3s. 4d. in the £. After some discussion the compulsory winding up proceedings were approved.

Contal Radio, Ltd., radio manufacturers and merchants, 33, New Inn Yard, E.C.2.—At a recent meeting of creditors an offer was made of a composition of 5s. in the £, and it was decided that a committee should be appointed to investigate the position and make recommendations. The committee now recommends acceptance of an offer of 5s. in the £, the two final instalments to be guaranteed by Mr. Gerson and to be secured by the deposit of a debenture for £500.

Dissolutions of Partnership

Wilkinson Bros., electrical engineers, 22, Albany Road and Guernsey Road, Sheffield.—Messrs. W. Wilkinson and N. Wilkinson have dissolved partnership. Mr. W. Wilkinson will attend to debts and carry on the business at Albany Road.

Milson Hopler Radio Manufacturing Co., radio manufacturers, 70 and 71, Farringdon Street, E.C.—Messrs. W. J. E. Miller, H. Hopson, J. W. Miller and R. E. Fraser have dissolved partnership. Mr. Miller and Mr. Fraser will attend to debts and carry on the business.

Edwards & Co., electrical engineers, 712, Christchurch Road, Boscombe.—Messrs. H. C. Edwards and F. Hollinghurst have dissolved partnership. Mr. Hollinghurst will attend to debts and carry on the business.

Auto Electrical Installation Co., electrical contractors and wireless dealers, 58a, Station Road, Port Talbot.—Messrs. B. Roberts and E. G. Thomas have dissolved partnership. Mr. Roberts will attend to debts and carry on the business.

Meeting of Creditors

General Accessories Co., Ltd.—A meeting of creditors will be held to-day (Friday) at Winchester House, E.C. A report issued by the committee of trade creditors states in liquidation a dividend is unlikely to exceed 5s. in the £. Proposals whereby the company might continue to trade and thereby provide a better ultimate return to creditors have been prepared. These include that trade creditors should receive not later than June 30th next a cash dividend of 2s. in the £ and that they should accept a further composition of 10s. in the £ to be secured by first debentures in the company, carrying interest at 6 per cent. per annum.

A petition for the winding up of the company has been presented to the High Court by Messrs. Davis & Timmins, and will be heard in London on March 14th.

Electricity Supply

Lighting, Domestic, Power

Accrington.—SWITCHBOARD ALTERATIONS.—It is reported, in connection with the grid supply, that it will be necessary to alter and make additions to the switchboard at a cost of £3,000.

Aldershot.—STREET LIGHTING IMPROVEMENTS.—The Town Council has decided to improve the lighting of the principal street at a cost of £1,903.

Bradford.—NEW SUB-STATION.—The Tramways Committee is to provide a traction sub-station at Pasture Lane, Clayton, equipped with two automatically controlled mercury arc rectifiers, at a cost of £2,700.

Burnley.—PLANT FOR SEWAGE DISPOSAL WORKS.—The Corporation Sewage Committee proposes the expenditure of £4,650 on gas engines, dynamos, and auxiliary plant for the generation of electricity at the Duckpits and Wood End sewage disposal works.

Canada.—BEAUHARNOIS POWER SCHEME.—The Ottawa correspondent of *The Times* states that the Government has made public an Order-in-Council giving the terms under which the Beauharnois Corporation may proceed with its power canalisation scheme on the St. Lawrence, west of Montreal. The diversion from the river into the canal of 53,712 cu. ft. of water a second under a 75-year lease from the Quebec Govern-

From war to peace: this tank at Ashford (Kent) is now used as a transformer kiosk

ment is sanctioned, but for any additional diversion the sanction of Parliament is necessary. The Government takes over the canal works and the company is left with easement over the power house and the necessary engineering works. It must also construct remedial works on the St. Lawrence to safeguard navigation. The board of the corporation has been reorganised, and now contains representatives of the banks which have been financing the project and other responsible men approved by the Federal and Quebec Governments.

CORRA LINN PLANT NEARLY COMPLETED.—The West Kootenay Power and Light Company has virtually completed its fourth development on the Kootenay River. This is known as the Corra Linn plant and is situated about one and a half miles above the Upper Bonnington plant. The installation comprises three units of 19,000 h.p. each, under a head of 53 ft.

Cannock.—LOANS SANCTIONED.—The Urban District Council has received sanction to the borrowing of £4,500 for mains and services, £3,000 for meters, £2,000 for house-wiring installations, and £1,000 for domestic electrical apparatus.

Carlisle.—STREET LIGHTING IMPROVEMENTS.—The City Council has instructed the electrical engineer to improve the electric lighting of the main streets of the town.

Cheadle and Gatley.—OVERHEAD LINES DECISION.—The Minister of Transport has upheld the Urban District Council's objection to the proposal of the Central Electricity Board to erect overhead lines through the middle of the district.

Chichester.—CONCESSION TO LARGE CONSUMERS.—The City Council has decided to place consumers of 50,000 kWh on the special scale hitherto limited to 75,000 kWh.

Continental.—ITALY.—A new 66,000-h.p. hydro-electric plant, which has been under construction for the past ten years, has recently been completed at Bordogna, near Bergamo (Northern tIaly), says *Reuter's Trade Service*. The unit forms part of a general plan for the development of water power in this highly industrialised district which contains cotton, silk and other factories.

According to *L'Energia Elettrica*, the capacity of the electric power stations in Italy at the end of December last amounted to 4,459,000 kW, as compared with 4,288,000 kW at the end of 1930. Of the total, hydro-electric plants are responsible for 3,662,000 kW, and thermal and internal-combustion engine

stations for 797,000 kW. The output of electricity in Italy during the whole of the past year is estimated at 9,809,570,000 kWh, as against 10,024,938,000 kWh in 1930.

RUSSIA.—It is reported that a commission of Italian engineers is at present engaged on behalf of the Soviet Government in making a survey of the water power resources of the Caucasus and Trans-Caucasia, with the object of eventually utilising them for hydro-electric and irrigation installations.

Craghead (Durham).—COUNCIL'S DECISION.—The Parish Council has decided to participate in the electric lighting "pool" proposed by the Lanchester Rural District Council. Ten parish councils are concerned.

Dornoch.—AGREEMENT WITH SUPPLY COMPANY.—The Town Council has approved a draft agreement with the Ross-shire Electricity Supply Co., Ltd., under which the Corporation is to contribute £2,000 towards the capital expenditure on the electricity scheme. The charge to dwellings and shops for lighting will be 8d. per kWh, and for heating and domestic purposes 4d. The Council guarantees a minimum revenue of £300 for the first year.

Dunoon.—POWER STATION EXTENSIONS.—To meet the increasing demands on the undertaking, plant extensions are now in progress at the Hamilton Street power station of the Dunoon & District Electricity Supply Co., Ltd. The additional plant comprises one Belliss & Morcom six-cylinder Diesel engine, coupled to a 500-kVA B.T.H. alternator. The generator panel, cubicle, switchgear, cables, and transformers, are by Messrs. Johnson & Phillips, Ltd. The additions are expected to be completed within three months, and the station generating capacity will then be raised to 1,000 kVA.

East Ham.—MAINS EXTENSIONS.—The Electricity Committee is to lay distributor cables in various streets at a cost of £12,127.

Fareham (Hants).—CHEAPER ELECTRICITY.—The Urban District Council has reduced the charge for electricity for lighting from 5d. to 4½d. per kWh.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee recommends the laying of distribution mains at a cost of £7,258.

Grays.—EXTENSIONS.—The Urban District Council has applied for sanction to a loan of £2,450 for the extension of the a.c. system of distribution.

Hetton-le-Hole (Durham).—STREET LIGHTING IMPROVEMENTS.—The Urban District Council has agreed to accept the offer of the Houghton-le-Spring and District Electric Lighting Co., Ltd., to improve the street lighting system by the erection of additional lamps.

Holmfirth (Yorks).—LOAN FOR ELECTRICAL APPLIANCES.—The Urban District Council has received sanction to a loan of £3,000 for the purchase of electrical appliances to be let out on hire.

India.—PUNJAB HYDRO-ELECTRIC SCHEME.—According to *The Times*, the tunnelling of the Dhauladhar range of the Himalayas, 200 miles from Lahore, in connection with the Punjab Government's scheme for the supply of electricity to the towns and villages of the Province, was completed on March 1st. The tunnel, 9ft. in diameter and nearly three miles long, was driven from both ends, and the two sections met without any apparent error in level or direction. It is expected that the first part of the scheme, providing for the generation of 36,000 kW and a grid of distributing lines for 17 large towns, will be ready next January. The second part of the scheme provides for the doubling of the supply, and the third for another 48,000 kW, making a total of 120,000 kW.

Inverness.—AMENDMENTS TO SPECIAL ORDER.—Important amendments to the Scottish Highland Special Electricity Order, 1930, were approved by the Parliamentary Bills Committee of Inverness County Council on March 2nd. As a result the town of Inverness and the district of Beauly are to be excluded from the scheme. A sliding scale of prices has been adopted, and the schedule of prices has been revised in favour of the consumer. A new clause has also been inserted, with regard to the compulsory laying down of mains by undertakers, to the effect that if the Minister of Transport thinks fit he may revoke the Order in this respect.

Japan.—POWER STATION EXTENSIONS.—Official permission has now been received for the proposed 30,000-kW extension of the Yamaguchi Prefectural Ube No. 2 thermal power station. Development schemes under the consideration of the Tokyo Electric Light Co. include the extension of some of its power stations by 20,000 kW and the erection of additional hydro-electric and thermal stations.

Keighley.—SUPPLY EXTENSIONS.—The Electricity Committee is considering the provision of a supply to Pickles Hill and Oldfield, the estimated cost of an overhead line being £2,500.

MAINS AND SERVICES.—Application has been made for sanction to the borrowing of £40,000 for mains and services.

SUPPLY TO BROOMHILL ESTATE.—The Housing Committee has decided to wire the house of any tenant of the Broomhill Estate who desires a supply of electricity, 3d. a week being added to the rent.

Leeds.—ASSISTED WIRING.—The Electricity Committee has received sanction to a loan of £15,000 for the assisted wiring scheme.

Malvern.—MAINS AND SERVICES.—The Urban District Council has applied for sanction to a loan of £5,000 for mains and services.

Manchester.—PROGRESS DURING JANUARY.—During the month of January the Corporation Electricity Department showed an increase of 1,346 kW in connections, making a total of 472,433 kW. New consumers (including additional supplies) numbered 1,642, representing 3,546 kW. There were 150 new cookers connected, bringing the total now on circuit to 9,007, while applications for the hire of cookers amounted to 199. Four new sub-stations were put into commission.

Newcastle-on-Tyne.—PROPOSED EXTENSIONS.—In a report presented recently to the Electricity Committee, Mr. A. J. C. De Renzi, borough electrical engineer, stated that the following extensions were considered necessary to cope with the increasing load:—Rotary convertor, with transformer and switchgear, £2,400; l.p. feeder to Nelson Place and l.p. distributor from Nelson Place, along West Brampton and Enderley Street to Liverpool Road feeder pillar, £3,650; alteration of e.h.p. truck type panels, £300; alteration to d.c. bus bars, etc., £150.

Nottingham.—LOANS.—The Electricity Committee recommends that application should be made for sanction to the following loans:—Mains and services, £120,000; sub-stations and equipment, £20,000; meters, £60,000; assisted wiring, £40,000; and domestic apparatus (cookers), £10,000.

Plymouth.—ELECTRICITY FOR AERODROME.—The Special Committee has authorised the provision of electricity to the aerodrome at a cost of £460.

Ripon.—SUPPLY TO KANGEL CROSS AREA.—The Electricity Committee has asked the engineer to proceed with the extension to the Kangel Cross area as soon as possible.

Rochester and Chatham.—NEW CHARGES.—The Kent Electric Power Co. has issued a new tariff for Rochester and Chatham. There are all-in rates for private premises, with a standing charge plus ¾d. per kWh, and for business premises, with a standing charge of 6s. 3d. per quarter per 100 W of installed lighting capacity plus ¾d. per kWh. The flat-rate charges have been reduced to 6d. per kWh for lighting and 1½d. for heating and power.

Scarborough.—STREET LIGHTING EXPERIMENTS.—The Town Council has been making experiments with electric street lighting, the street lighting of the town at present, including the sea front, being by gas. If the Council's decision is in favour of replacing gas by electric lighting it is expected that electricity will be adopted on the tramway routes and main streets, but gas retained elsewhere. Tests have also taken place of various illumination, decorative and floodlighting features being installed in the newly constructed North Bay Pleasure Park and around the new lake. All the pleasure park lighting is electric.

South Africa.—PROPOSED NEW SCHEME FOR LICHTENBURG.—Mr. H. Val Davies, consulting engineer, Johannesburg, recommends the Lichtenburg Town Council to adopt a new electricity supply scheme costing £25,000. He is in favour of steam-driven plant in preference to oil, and the use of alternating current.

South Shields.—STREET LIGHTING.—The Town Council has instructed the electrical engineer to report on the estimated cost of converting to electricity the streets in the town still illuminated by gas.

Sutton Coldfield.—ELECTRICITY FOR RECTORY ESTATE.—The Electricity Committee is to arrange for a supply of electricity to the Rectory Estate, New Oscott (where 250 houses are to be erected), at a cost of £2,100.

Tonbridge.—CHANGE-OVER DECISION.—The Urban District Council has decided to proceed with another section of the change-over at an estimated cost of £1,280, with an additional £880 for changing consumers' services, meters, etc. A further portion of the work will be undertaken next year.

Tunbridge Wells.—GRID SUPPLY.—As the outcome of negotiations with the Central Electricity Board the Town Council has decided to take a supply from the grid. The tariff will be £3 5s. per kW per annum, plus 0.2d. per kWh, this being a temporary arrangement for about two years, when the Council will have to take a supply at a rate fixed for the south-eastern district.

Venezuela.—NEW POWER STATION COMPLETED.—A new hydro-electric power station has recently been completed and put in operation on the River Aragua, near Caracas, by the Compania Venezolana de Electricidad.

West Ham.—LOANS.—The Town Council is recommended to apply for sanction to loans of £7,298 for two cooling towers, £1,150 for foundations and steel work, and £2,210 for piping valves, etc.

Whitby.—EXTENSIONS.—An agreement has been arrived at by the Urban and Rural District Councils for the extension of the former's electricity scheme to Sleights and Robin Hood's Bay.

Wimbledon.—LOANS SANCTIONED.—The Electricity Committee has received sanction to loans of £7,000 for domestic electrical apparatus and £50,000 for mains and services.

CHEAPER ELECTRICITY.—It has been decided to reduce the flat rate for private lighting from 3½d. to 3¼d. per kWh as from

the commencement of the June quarter and no rental is in future to be charged for the main domestic power meters in private houses where electric lighting meters are also installed.

Worcester.—REVISION OF CHARGES.—The City Council has decided that as from the end of the current quarter, the new house assessments shall be taken as the basis for the fixed charge for electricity (where consumers pay on a rateable value basis), and that the fixed charge shall be reduced from 20 to 17½ per cent.

Workington (Cumberland).—SCHEME FOR STAINBURN.—The Mid-Cumberland Electricity Co. is to begin operations shortly on the electrification of the village of Stainburn.

York.—CABLE EXTENSIONS.—The Electricity Committee is to extend cables at a cost of £3,130 to supply the Gringhouses and Bishopsthorpe districts.

CHANGE-OVER PROGRESS.—The change-over in the centre of the city has now been completed and it is proposed during the current year to complete the change-over in five other districts at a cost of £6,110.

RURAL ELECTRIFICATION.—A supply of electricity has now been made available for the villages of Claxton, Flaxton, and Sand Hutton.

Traction

Bolton.—TRAFFIC SIGNALS.—The Watch Committee is to install automatic traffic signals at fourteen road junctions.

Carlisle.—AUTOMATIC TRAFFIC CONTROL.—The Highways Committee has recommended the City Council to erect automatic traffic signals at five points in the town.

Coventry.—BUSES REPLACE TRAMS.—Buses have now been substituted for trams on the Allesley Old Road route.

Derby.—SUCCESS OF TROLLEY BUSES.—The Corporation, which opened a new trolley-bus service in January with six double-deck vehicles, made by Guy Motors, Ltd., has just placed a repeat order with the same firm for fourteen more of its six-wheeled double-deck trolley-bus chassis. The original fleet has proved so satisfactory that Derby has decided to convert another route to this method of transport.

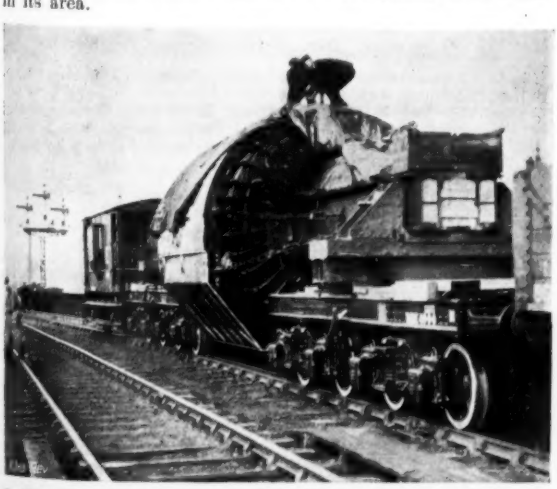
Glasgow.—UNDERGROUND ELECTRIFICATION PROPOSALS.—Proposals for the running of electric trains on Glasgow's municipal subway, which would replace the present cable haulage system, were discussed by the Corporation Transport Committee on March 2nd. Since the system was taken over by the Corporation twelve years ago it has not paid. Suggestions have been made from time to time to electrify the whole undertaking, but investigation showed that the cost of such a scheme would be prohibitive. Recently, however, experiments have been carried out with electric motors attached to each coach or train, and it is claimed that the substitution of electric motors for the present system would give a speedier service, combined with greater comfort for the passengers and a substantial reduction in operating costs. It is estimated that the cost of providing a new electric underground railway would be in the region of £1,000,000, and to enlarge the system to make it serve an area of twenty miles, as has been suggested, would cost at least £20,000,000.

India.—CALCUTTA.—Experiments are being carried out in Calcutta with electric traffic control signals.

Newcastle-upon-Tyne.—THE OSBORNE ROAD ROUTE.—A public meeting of residents in the Jesmond area is to be held on March 16th to discuss the future of the Osborne Road trams.

South Shields.—"LUXURY" TRAM IN SERVICE.—The Corporation last week placed in service the first of the sixty-eight trams which are being reconstructed on "luxury" lines. Improvements are being made in the lighting, seating, and ventilation.

West Riding.—TRAFFIC SIGNALS.—The County Council is to provide automatic traffic signals at seven junctions on roads in its area.



A 119-ton stator en route from the works of C. A. Parsons & Co., Ltd., to the Dunston station of the Newcastle-upon-Tyne E.S. Co.

Communications

Albania.—NEW BROADCASTING STATION.—An American company proposes to erect a 150-200-kW station in Albania. Announcements are to be made in the Serbian, Italian, German and Hungarian languages. The Government is to receive 50 per cent. of the profit.

Brazil.—RADIO-TELEPHONE EXTENSIONS.—Hitherto although connected with the United States, Canada, Mexico, and Cuba by the 4,800-mile circuit between Rio and New York, which was opened in December, Brazil has been the only important South American state without a service to Europe. Such a service has now been made possible by the short-wave radio station recently completed in Brazil. The transmitting station is at Marapicú, 37 miles, and the receiving station at Jarcarepagna, 22 miles west of Rio. Both stations are connected by telephone lines to the central office in the Norte exchange of the Brazilian Telephone Company. Brazil is the fourth South American country to be brought within reach of North American telephones, Argentina, Chile, and Uruguay having been connected since April, 1930.—*Reuter's Trade Service* (Rio de Janeiro).

Bulgaria.—NEW TELEPHONE SYSTEM OPENED.—The telephone system between Jugo-Slavia and Bulgaria was opened on February 1st this year.

Canada.—WIRELESS LICENCES TO COST MORE.—The House of Commons has appointed a special committee to consider the whole situation of broadcasting in Canada, with particular reference to the recent report of the Royal Commission, which recommended a national system corresponding to that which exists at present in Great Britain. Meanwhile the Government has announced that it intends to increase the cost of the annual licence for a wireless receiving set from one to two dollars. This affects over 600,000 registered licences. The fees for commercial broadcasting stations are also to be increased.—*Reuter* (Ottawa).

Great Britain.—RADIO EXCHANGES.—The Rotherham Transport Committee has given Clear-Radio, Ltd., permission to use 35 tramway standards for the purpose of carrying lines through certain streets in the centre of the town at an annual rental of 2s. per pole, the company to be responsible for any damage to persons or property through falling wires, electric shocks, &c.

The Eastbourne Corporation Highways Committee has decided that no advantage would accrue to the town from a radio relay service, and as no application for such service had been received from residents the Committee could not grant permission to install such a system to any of the applicants who had applied for permission to do so.

An application by Wired Wireless, Ltd., for permission to establish a relay system in the city has been remitted by the Glasgow Corporation Streets Committee to the special subcommittee appointed in connection with other similar applications.

The Southwark Works Committee has had an application from the British Relay Wireless Co. and recommends asking the Metropolitan Boroughs Standing Joint Committee to consider the whole question regarding overhead relay wires and legislation governing the matter.

India.—EQUALISATION OF CABLE AND WIRELESS RATES.—Imperial and International Communications, Limited, announces that on and after April 1st next the cable rates for telegrams from Great Britain to India and Burma will be reduced and the cable and wireless rates will be equalised as follows: ordinary telegrams 1s. 3d. and deferred telegrams 7½d. per word. The charge for daily letter telegrams of 20 words will be 6s. 8d. with 4d. for each additional word, while that for week-end letter telegrams will be 5s. for 20 words with 3d. for each additional word.

Pacific Coast.—RADIO BEACONS.—Six more radio beacons are being constructed and will be put into operation as soon as possible. There will then be 22 stations working on the Pacific coast and covering the entire American shore from Scotch Cap, near the outer end of the Aleutian Islands, to Los Angeles, California. Two of the new stations will be placed at the Panama Canal and the Island of Haiwai. All the beacons will operate for part of each hour day and night, and continuously during fog or low visibility.—*Reuter's Trade Service* (Panama).

York.—TELEPHONE PROGRESS.—The annual report of the local T. & T. Advisory Committee for 1931 shows that in the north-eastern district (superintending engineer: Mr. J. W. Atkinson) new telephones connected numbered 7,106, but cessations reached the high figure of 4,701, making the total in use 50,265. Some 17 exchanges serve 64 per cent. of the telephones in this district of 7,000 square miles, the remaining 36 per cent. being spread over 319 exchanges. There were 39,695 business rate and 10,570 residential rate subscribers, while there were 24,011 automatic and 26,254 manual stations; 39 new rural exchanges raised the total to 81. The number of call offices, including kiosks, increased by 145 (of which 107 were in rural areas) to a total of 1,684. The use made of the trunk service was greater than in any previous year, increasing by 3 per cent. to 4,705,666 calls. Junction and local calls numbered 23,136,000. There was a further slight decrease of 2 per cent. in the number of phonograms, which totalled 488,735.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—April 11th. City Council. Lift motors and control gear. (A.X. 11273.)*
LAUNCESTON (TAS).—April 25th. City Council. Motor generator. (A.X. 11291.)*

Aylesbury.—March 14th. Electricity Department. General stores. (February 26th.)

Belgium.—BRUSSELS.—March 23rd. Régie des Télégraphes et des Téléphones, Salle de la Madeleine. Supply and laying of telephone cables in the Liège district.

Edinburgh.—March 16th. Corporation. Various works in connection with extension to grab bunkers at Portobello power station and transformer house at Stenhouse Mills. City architect.

Egypt.—CAIRO.—March 28th. Ministry of the Interior. Electrically driven pumping set, switchboard instruments, etc., for Minia. (G.X 11252.)*

Erith.—March 18th. Electricity Department. H.p. and l.p. switchgear and other apparatus for sub-station equipment. (February 26th.)

Exminster.—March 23rd. Devon Mental Hospital Committee. Six months' supplies of electrical goods, etc. Mr. Cecil Masters, clerk.

Great Crosby (Liverpool).—March 29th. Urban District Council. Twelve months' supply of electric lamps. Mr. J. A. Wright, surveyor, Town Hall.

Great Western Railway.—May 2nd. Electric wires and cables, telegraph iron work, and lamps. (See this issue.)

Halifax.—March 14th. Renewal of electric lighting installation at Bankfield Museum. Mr. W. H. Ostler, secretary, Education Offices, West House, Halifax.

Hull.—March 17th. Mental Hospital Committee. Electric lighting installation at proposed nurses' home, Willerby Mental Hospital. City architect, Hanover Square, Hull.

Ilford.—March 17th. Electricity Department. Rotary convertor and rectifier plant. (March 4th.)

India.—NEW DELHI.—March 31st. India Store Department. Rubber-covered cables. (A.X. 11286.)*
April 7th. Lead-covered cables. (A.X. 11285.)*

London.—March 15th. County of London Electric Supply Co., Ltd. Cables and accessories for Barking power station extensions.
OFFICE OF WORKS.—March 17th. Electrical and mechanical labour in Birmingham (mechanical only), Bristol and Liverpool districts. (March 4th.)
BETHNAL GREEN.—March 21st. Borough Council. Electric lighting installation work at a block of tenement buildings. (March 4th.)
CENTRAL ELECTRICITY BOARD.—April 11th. 33-kV overhead transmission lines. (See this issue.)

Manchester.—March 19th. Electricity Committee. Voltage variation equipment. (March 4th.)

Morley.—March 21st. West Riding Education Committee. Installation of electric lighting at the Grammar School (Textile Department). Education officer, County Hall, Wakefield.

New Zealand.—WELLINGTON.—June 2nd. Government Railways. Butt and arc welding sets. (A.X. 11279.)* Electrically-operated 15-ton overhead travelling crane. (A.X. 11281.)*

Norfolk.—March 18th. Public Health and Assistance Committee. Electrical installation at Downham Market Poor Law Institution. Mr. C. J. Norton, architect, Stracey Road, Norwich.

Sevenoaks.—March 16th. Rural District Council. Installation of electric lighting at houses at Dunton Green. Building surveyor, Oakhill Road.

South Africa.—CAPETOWN.—April 6th. Electricity Department. L.p. ironclad switchgear. (A.X. 11274.)*

Turton.—March 15th. Urban District Council. Cable, meters, joint boxes, ironclad fuses and sealing chambers. Electrical superintendent, Council Offices, Bromley Cross, near Bolton.

Walthamstow.—March 23rd. Electricity Department. Cables. (March 4th.)

Westhoughton (Lancs).—March 19th. Urban District Council. Twelve months' supply of metallic filament lamps. Mr. G. Hayes, U.D.C. surveyor, Town Hall.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Corporation. Recommended. Electric lighting at housing scheme (£1,447).—Bell & Robertson, Ltd.

Barrow-in-Furness.—Electricity Committee. Accepted. Bare copper wire (£261).—Thomas Bolton & Sons, Ltd.

Bradford.—Mental Welfare Committee. Accepted. Electric lighting installation at Westwood estate (£1,895).—Armitage and Longbottom.

East Ham.—Cleansing Committee. Recommended. Two 3½-ton electrically propelled refuse collecting vehicles (£1,769).—Electricars, Ltd.
Electricity Committee. Recommended. Additional panel (£82).—George Ellison, Ltd.

Glasgow.—Corporation Cleansing Director. Accepted. Four batteries for electric refuse vehicles (£552).—Tudor Accumulator Co., Ltd.
Corporation Education Committee. Recommended. Electric lighting installation at Possil School (£614).—D. Henderson.

Kidderminster.—Baths Committee. Recommended. Electric lighting at baths, Castle Road (£145).—S. J. Beard.

Leeds.—Tramways Committee. Accepted. Two tramcar lifts (£410).—Maley & Taunton, Ltd.
Electricity Committee. Accepted. Generating station switchgear (£1,891).—Ferguson, Pailin, Ltd. Cable.—W. T. Henley's Telegraph Works Co., Ltd. (£118); Enfield Cable Works, Ltd. (207); Macintosh Cable Co., Ltd. (£486); Edison Swan Cables, Ltd. (£659).

Liverpool.—Tramways and Electric Power and Lighting Committee. Recommended. Stores for 12 months. Cables.—Mersey Cables, Ltd.; Liverpool Electric Cable Co., Ltd. Electric lamps.—Omega Lampworks, Ltd.; Tungstalite, Ltd.; Commercial Electric Co., Ltd.; L. Andrew & Co., Ltd. Electric cookers and kettles.—Automatic Electric Co., Ltd. Electricity meters.—Ferranti, Ltd. Cables, compounds, &c.—Callender's Cable & Construction Co., Ltd.; British Insulated Cables, Ltd.
Port Sanitary and Hospitals Committee. Accepted. Electrically driven pump for the water supply at Walton Hospital (£110).—Gwynnes Pumps, Ltd. Supplies of electrical goods to the various city hospitals and institutions. General electrical supplies.—Simplex Conduits, Ltd.; General Electric Co., Ltd.; Electrical Conduits, Ltd.; Edison Swan Electric Co., Ltd.; Falk, Stadelmann & Co., Ltd.; Electrical Components, Ltd.; Lind & Co., Ltd.; Baxendale & Co., Ltd. Electric cables, flexibles, &c.—Lind & Co., Ltd.; Greengate & Irwell Rubber Co., Ltd.

London.—L.C.C. Education Committee. Recommended. Electrical installation at Hanover Street School, Islington (£504).—T. Clarke and Co., Ltd.

Northern Ireland.—Electricity Board. Accepted. Transmission lines for the Harbour power station to Orangefield, Belfast.—Callender's Cable Construction Co., Ltd. Transmission line between Dungannon, Poyntzpass, and Rostrevor.—Craven and District Electric Construction Co.

Plymouth.—Electricity Committee. Accepted. Meters.—Metropolitan-Vickers Electrical Co., Ltd.; Chamberlain & Hookham. Ltd. E.h.p. switchgear.—General Electric Co., Ltd.; A. Reyrolle & Co., Ltd. L.p. switchgear and transformers.—General Electric Co., Ltd. Time switches.—Venner Time Switches, Ltd.

Rugby.—Urban District Council. Accepted. Five transformers and h.p. and l.p. switchgear (£204 per set).—British Thomson-Houston Co., Ltd.

Torquay.—Electricity Committee. Accepted. Erection of overhead line from Ashburton to Newton Abbot (£2,794).—Pirelli-General Cable Works.

Wimbledon.—Electricity Committee. Accepted. Three 1,000-kVA transformers (£945).—Foster Engineering Co. Four 200-kVA transformers (£312).—Hackbridge Electric Construction Co., Ltd. E.h.p. switchgear (£1,696).—A. Reyrolle & Co., Ltd. H.p. switchgear (£715).—English Electric Co., Ltd. L.p. switchgear (£1,179)—George Ellison, Ltd.

Worthing.—Electricity Committee. Accepted. Balancing apparatus for Lansdowne Road sub-station (£950).—Hewittic Electric Co., Ltd.

Forthcoming Events

Birmingham Electric Club.—Friday, March 11th. Grand Hotel, Birmingham. 7 p.m. Annual dinner. Friday, March 18th. Grand Hotel, Birmingham. 7 p.m. "Electric Traction." Mr. E. T. Hippisley.

Association of Ex-Siemens' Men.—Friday, March 11th. Gatti's Restaurant, W.C. Smoking concert.

Royal Institution.—Saturday, March 12th. Institution, London. 3 p.m. "The Electron." Lord Rutherford.

Electrical Association for Women.—Saturday, March 12th. 10.30 a.m. Visit to the showrooms of Messrs. Falk, Stadelmann & Co., Ltd., Farringdon Street, E.C. Wednesday, March 16th. 3 p.m. Visit to International Refrigerator Co., Ltd., Regent Street, W.

Belfast Association of Engineers.—Saturday, March 12th. Belfast. Annual dinner.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, March 12th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Vulcanisation of Trailing Cables." Mr. L. W. Bindon.

Institute of Transport.—Monday, March 14th. Institution of Electrical Engineers, London. 5.30 p.m. Joint meeting with Institution of Railway Signal Engineers. "Railway Colour Light Signalling in Relation to Manual Block and Multiple Aspect Signals." Mr. A. F. Bound.

Paisley Association of Electrical Engineers.—Tuesday, March 15th. Y.M.C.A., Paisley. 7.30 p.m. "Wireless." Mr. J. H. Ballantyne.

Association of Supervising Electrical Engineers.—Tuesday, March 15th. Junior Institution of Engineers, London. 7.15 p.m. "Private Generating Plant *versus* the Grid." Mr. R. S. Whaley.

Overhead Lines Association.—Wednesday, March 16th. Institution of Electrical Engineers, London. 5.30 p.m. Discussion on Wayleaves. Opened by Mr. R. J. Jocelyn Swan.

Institution of Civil Engineers.—Wednesday, March 16th. Institution, London. 6 p.m. Informal meeting. "Possibilities of Reducing Heat-losses in Circulating Water in Power Stations." Messrs. I. V. Robinson and S. B. Donkin.

Institution of Electrical Engineers.—Thursday, March 17th. Institution, London. 6 p.m. "Faults and their Clearance on Large Networks." Messrs. R. O. Kapp and C. G. Carrothers. "Some Notes on Oil Circuit-Breaker Design and Performance."

Messrs. H. Pearce and T. T. Evans. (*London Students' Section*).—Friday, March 11th. Institution, London. 6.15 p.m. "The Bypath Automatic Telephone System." Messrs. J. W. Moffatt and K. B. Baldwin. Wednesday, March 16th. 3 p.m. Visit to the Quasi-Arc Co., Ltd., Grosvenor Gardens, S.W. 8 p.m. Victoria Hall, Southampton Row, W.C. Dance. (*North-Midland Centre*).—Friday, March 11th. Hotel Metropole, Leeds. 7 for 7.30 p.m. Annual dinner. Tuesday, March 15th. Albert Hall, Leeds. 7.30 p.m. Faraday Lecture. "Everyday Uses of Electricity." Prof. J. K. Catterson-Smith. (*South Midland Students' Section*).—Saturday, March 12th. 3 p.m. Visit to works of Steatite & Porcelain Products Co., Stourport. (*North-Eastern Centre*).—Monday, March 14th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Future Progress in Electrical Measuring Instruments." Dr. C. V. Drysdale. (*Western Centre*).—Monday, March 14th. Cardiff. 6 p.m. "Modern Boiler Plant." Mr. J. Bruce. (*North-Western Centre*).—Tuesday, March 15th. Engineers' Club, Manchester. 7 p.m. "Some Notes on Oil Circuit-Breaker Design and Performance." Messrs. H. Pearce and T. T. Evans. (*Tees-Side Sub-Centre*).—Tuesday, March 15th. Grand Hotel, Middlesbrough. Annual dinner. (*Sheffield Sub-Centre*).—Wednesday, March 16th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Discussion on "The Use of the Mercury-Arc Rectifier in Electric Supply." Opened by Mr. E. Morgan. (*Meter and Instrument Section*).—Friday, March 18th. Institution, London. 7 p.m. Informal discussion. (*North-Eastern Students' Section*).—Friday, March 11th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "Three-phase Alternating Current Commutator Motors." Messrs. H. T. Price and C. T. Webster. Saturday, March 19th. 2.30 p.m. Visit to Dunston power station.

Manchester Electro-Harmonic Society.—Friday, March 18th. Waldorf Hotel, Manchester. 7 p.m. Smoking concert.

British Electrical Development Association.—Friday, March 18th. City of London Electric Restaurant, E.C. "Electric Heating of Buildings." Mr. R. Grierson.

Illuminating Engineering Society.—Friday, March 18th. Royal Society of Arts, W.C. 7.15 p.m. "The Application of Electric Light to Agriculture." Mr. F. E. Rowland.

Physical Society.—Friday, March 18th. Imperial College of Science, South Kensington, S.W. 5 p.m. Annual general meeting.

Notes

The I.M.E.A. Convention

The provisional arrangements for this year's I.M.E.A. convention, which is to be held in Cardiff from June 15th to 18th are as follows:—

Wednesday, June 15th.—2 p.m.: Convention office at the City Hall open for issue of badges. 8.15 p.m.: Reception by the President (Mr. C. G. Morley New), Cardiff Electricity Committee, and the Lord Mayor of Cardiff (Ald. C. W. Melhuish, J.P.). Dancing and music until 1 a.m.

Thursday, June 16th.—10 a.m.: (a) Civic welcome by the Lord Mayor; (b) Presidential address; (c) Mrs. Morley New will receive ladies in the luncheon room. 11.30 a.m.: Paper and discussion, "The Organisation and Development of the Small Electricity Undertaking," by Mr. F. Newey (engineer and manager, Long Eaton). 2 p.m.: Coast tour (ladies only). 3 p.m.: Paper and discussion, "Street Lighting," by Messrs. W. J. Jones (E.L.M.A.) and J. N. Waite (engineer and manager, Hull). 6.45 p.m.: Reception and annual dinner (12s. 6d.) at Assembly Room. Dancing until 1 a.m. (restricted to diners).

Friday, June 17th.—9.30 a.m.: Council meeting. 10.30 a.m.: Annual general meeting. Visit to Cardiff Castle (ladies only). 2 p.m.: Wye Valley tour. 2.30 p.m.: Visit to works of Messrs. Whitehead Iron and Steel Co., Newport.

Saturday, June 18th.—10.30 a.m.: Visit to Cardiff electricity works.

The headquarters of the Council will be the Angel Hotel, Cardiff.

Premature Switching Causes Fatality

An inquest was held at Chester Moor (Co. Durham) last Friday on the body of Norman Forster (aged 35), an electrician. Norman Short, electrician, said that he accompanied deceased in Chester Moor mine to disconnect a cable box. A coal cutter asked if he could have the power on, and was informed that it would be available in ten minutes. About five minutes later Forster fell back dead. The deputy-coroner considered that the electricians should themselves cut off the current and take with them the detachable handle of the switch. Mr. G. R. Ripath, agent of the colliery company, stated that regulations had already been issued which would prevent the occurrence of a similar accident. The verdict was "Accidental death."

The Poultry Farm

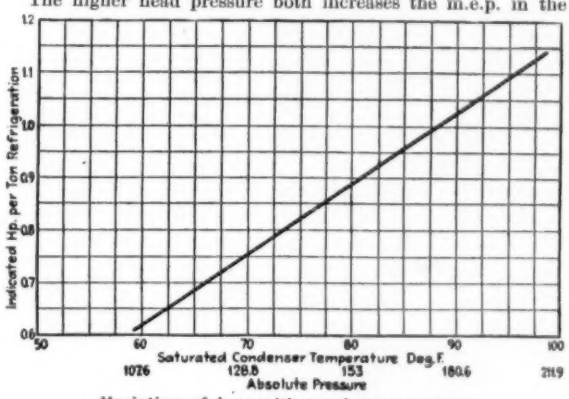
"Electricity on the Poultry Farm" is the title of E.D.A. publication No. 981. It contains a great deal of data of use to poultry keepers and is well illustrated. The load is worth having as there are many poultry farms using from 10,000 to 20,000 kWh per annum, and the Buttercup Poultry Farm, near Edinburgh, one of the largest in the world, is all-electric (ELECTRICAL REVIEW, Nov. 21st, 1930).

Electric lighting at both ends of the winter day to provide 12 to 14 hours of feeding is found to give best results, especially with first season's birds. Forty-eight pullets will lay 1,000 more eggs in the six winter months in an artificially lighted hen house using 33 kWh in the period than under natural conditions. The temperature of an electric incubator can be maintained within ¼ deg. F. of the required value (from 102 to 105 deg. F.). The cost of fitting electric heaters into oil or gas-heated incubators varies from £3 10s. to £5 for 30-egg and 400-egg sizes, respectively. A 100-egg incubator consumes 25 kWh and a 16,000-egg incubator 500 kWh in 21 days. Plucking birds by hand costs 2d. each, by electricity 1d. Bone grinders driven by 2-h.p. motors use 1¼ kWh per 100 lb.

Refrigerator Condenser Tubes

A coating of foreign matter on the condenser tubes of a refrigerator retards the transfer of heat from the ammonia to the cooling water; this requires a greater mean temperature difference between the two fluids, which must be obtained by a corresponding rise in the condensing temperature of the ammonia, resulting in increased head pressure.

The higher head pressure both increases the m.e.p. in the compressor and lowers the volumetric efficiency, which results in an increased consumption of electricity.



Variation of h.p. with condenser pressure

The measure of the increase is shown by *Power* to be in accordance with the accompanying graph. The evaporative temperature is assumed to remain constant at 5 deg. F., corresponding to a suction pressure of 19.6 lb. gauge.

The E.A.W.

At the second annual luncheon of the Bradford and District Branch of the Association, Ald. Kathleen Chambers occupied the chair. Ald. W. Illingsworth, Deputy Lord Mayor of Bradford, in proposing "The Association," remarked that in 1925 the domestic consumption of electricity in the city was four million kWh and over one square mile of the industrial area of Bradford 210 tons of grit, soot, and other falling matter had been measured. In 1930 the consumption was sixteen million kWh and the amount of grit recorded was only 35 tons. Miss C. Haslett and Mrs. W. H. Thompson, chairman of the Harrogate branch, responded. The report of Miss Eva Moss, hon. secretary, showed the branch membership to be 88.

"Electricity and the Working Woman" was the subject of an address given by Miss V. Brice (Beckenham) at the recent annual meeting of the Torquay branch of the Association.

The Birmingham branch of the Association held its annual dinner at the Imperial Hotel, Birmingham, on March 4th, Dame Ethel Shakespeare presiding. Proposing the toast of the Association, the Lady Mayoress (Mrs. J. B. Burman) said the rapid growth of the Association was a proof of the need for its establishment. Miss Haslett, in reply, said that Birmingham formed the first provincial branch of the Association in England. To-day there were 5,000 members throughout the country and 28 branches.

Midland Engineers' Conversazione

The annual conversazione under the joint auspices of the Birmingham and District Association of the Institution of Civil Engineers, the Midland branch of the Institution of Mechanical Engineers, and the South Midland Centre of the Institution of Electrical Engineers took place on March 4th at Edgbaston Assembly Rooms. About four hundred members and their ladies were present. Mr. W. Taylor, president, Institution of Mechanical Engineers, welcomed the guests.

Fire at Electric Farm

On March 3rd the power station and experimental workshops of Mr. R. Borlase Matthews at Greater Felcourt, East Grinstead, were destroyed by fire. Valuable farming equipment and experimental work was lost, but the farm buildings were saved by the prompt action of the Lingfield Fire Brigade. The fire, which originated near an oil engine, was not due to an explosion or to the failure of any electric cable.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

NETTLES bakelite lampholder.
DORCAS electric cooker.
KOH-I-NOR electric hair clippers.
HELMET hair-dryer.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. J. Jennings was presented with a silver tea service at the "electrical" luncheon of the Birmingham Section of the British Industries Fair last week, in recognition of his work in connection with the electrical display at Castle Bromwich from its inception.

[Lafayette.]
Sir Holberry Mensforth, Chairman of the English Electric Co.

Sir Holberry Mensforth, whose speech at the annual meeting of English Electric Co., Ltd., is reported in our "City Notes" today, became chairman of that company in 1930. He commenced his career as assistant to the late Mr. B. H. Thwaite, of Westminster, the pioneer of blast furnace gas engine installations. In 1904 he joined the British Westinghouse Co. (now the Metropolitan-Vickers Electrical Co., Ltd.), and subsequently became general manager. From 1920 to 1926 he was Director-General of Factories under the War Office. He is a K.C.B., a C.B.E., and M.Sc. (Tech.). He is also a member of the Institutions of Civil and Mechanical Engineers.

Sir Holberry takes an optimistic view of the "English Electric's" future.

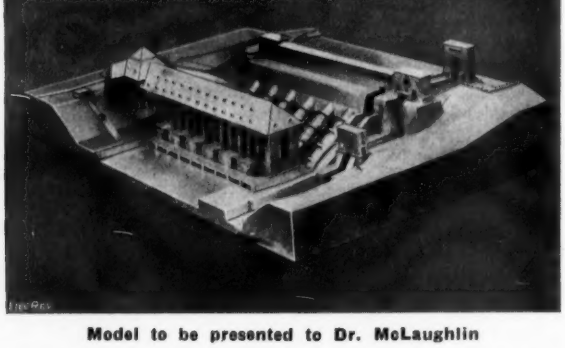
The following appointments and alterations have been made in the staff of representatives of the Northern Steel and Hardware Co., Ltd.:—**Mr. G. E. H. Harris,** late of Messrs. S. A. Lamplugh, Ltd., has taken over the West Lancashire territory; **Mr. C. Hughes,** formerly of Flexible Electric Cords and Amalgamated Lamp Co., the North Wales territory; **Mr. H. Hotchen,** the Salford area of Manchester; and **Mr. E. H. Maltby,** who has been representing the company in Sheffield and surrounding districts has been transferred to the Cheshire area.

Mr. John Hood, of the Edison Swan Electric Co., Ltd., who has retired after 42 years' service, was recently presented with a walnut bookcase at the company's works, Ponders End. Mr. F. V. Hasemore, general manager, in making the presentation said that Mr. Hood joined the Swan Electric Light Co., Ltd., in 1881, and remained with the company until 1887 when he accepted an appointment elsewhere. He returned to the company, however, in 1897 and had been with them ever since. He was in charge of the Radio Repairs Department when he retired.

Mr. P. M. Rossdale has resigned from the board of the Shropshire, Worcestershire and Staffordshire Electric Power Co., Ltd.

Mr. T. Mohn has severed his connection as chief designer and works manager of the Vertical Engine Department of the National Gas Engine Co., Ltd., and has set up in business as a consulting engineer on his own behalf at 10, Rushford Avenue, Levenshulme, Manchester.

As we have already reported, **Dr. T. A. McLaughlin,** the director of the Shannon scheme, is to be presented with a silver model of the Ardnacrusha power station at which the Shannon



Model to be presented to Dr. McLaughlin

is harnessed for supplying electricity to the whole of the Irish Free State. A picture of the model appears above.

Mr. Theodore Claisen is retiring after 57 years' service with Messrs. Jensen & Nicholson, Ltd., the paint and varnish manufacturers of Stratford, E. Mr. Bernard J. Nicholson, managing director of the company, recently paid a glowing tribute to Mr. Claisen.

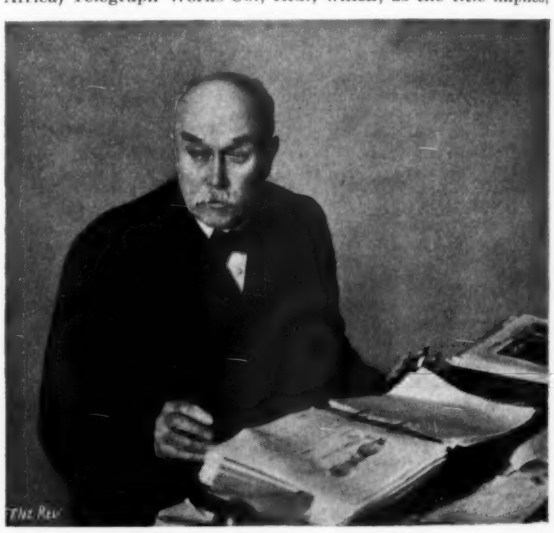
Messrs. Mackness & Shipley, referring to the recent death of Mr. H. D. Wilkinson (reported in our last issue), inform us that an agreement for business association between Mr. Wilkinson and their firm was arranged last autumn, to become operative as from January 1st. In accordance with this agreement it is provided that, in the event of Mr. Wilkinson's death, his practice is to be continued by them in the associated names, for the benefit of his estate, for a definite period. Messrs. Mackness & Shipley are therefore dealing with all the current business of the practice from Parliament Mansions, Victoria Street, S.W.1.

Mr. Stephen Robinson, manager of the municipal tramways at Douglas, Isle of Man, is retiring at the end of March. He was formerly with Mr. Lightfoot, who planned the system, which was subsequently taken over by the Corporation.

Mr. F. J. Richards, a member of the Wolverhampton staff of the Electric Construction Co., Ltd., has again been elected honorary secretary of the Staffordshire County Amateur Bowling Association.

Mr. J. R. Taylor, a Dundee electrical engineer, has been appointed chief electrical engineer at Saskatoon, Canada. Before going abroad, Mr. Taylor was with the firm of Keith & Pratt, Aberdeen, and prior to that he was associated with Messrs. Maxwells, Ltd., Dundee.

Mr. W. J. Potter, whose portrait accompanies this note, entered the service of W. T. Henley's Telegraph Works Co., Ltd., on May 8th, 1887, so that he has completed nearly forty-five years' service. He joined the company as town traveller and secretary of an associated company, Henley's (South Africa) Telegraph Works Co., Ltd., which, as the title implies,



Mr. W. J. Potter, of Henley's

operates in the Union of South Africa. He was appointed a director on May 23rd, 1913, and has continued as a working director, attending the office every day since then.

At Henley's annual staff dinner last week Mr. Potter announced that at the end of the month he was retiring from his staff position, but that he would continue to act in the capacity of director of the company.

Owing to the expansion of the Electrical Association for Women, **Miss C. Haslett** has resigned her directorship of the Bungay Gas and Electricity Co. Her sister, **Mrs. R. Messenger,** has been appointed as director in her place and also as secretary of the company.

Mr. H. Stafford has been appointed by the Barrow-in-Furness Corporation Tramways Committee as maintenance engineer in the Transport Department at a salary of £300 per annum.

Mr. P. H. Davies has been appointed a director of the Pernambuco Tramways and Power Co., Ltd., in place of **Mr. L. Banigan,** who has resigned.

Mr. H. W. Biskeborn has resigned his position as chief sales engineer to the Hackbridge Electric Construction Co., Ltd., with whom he has been for the last nine years. He will shortly take up an appointment with Messrs. Crompton, Parkinson, Ltd.

The Times reports that a complimentary dinner to **Mr. P. J. Pybus,** Minister of Transport, and M.P. for the Harwich division, is to be given at the Town Hall, Clacton-on-Sea, on March 18th.

The engagement is announced of **Mr. John M. Hawkins**, managing director of Messrs. Mortimer, Gall & Co., Ltd., to Miss Constance Meachem, of Great Barr, Birmingham. Miss Meachem will be remembered by our Midland readers for her broadcasts from the Birmingham studio of the B.B.C.

Obituary

Dr. E. H. Griffiths.—The death is reported on March 3rd at Cambridge, in his eighty-first year, of Dr. Ernest Howard Griffiths, M.A., D.Sc., Hon.LL.D., F.R.S., formerly Principal and Professor of Experimental Philosophy at the University College of South Wales and Monmouthshire. His most notable work was based upon his researches in heat, concerning which he contributed several papers to the transactions of the Royal Society, from whom he received the Hughes Gold Medal for his researches in exact physical measurements. Present-day knowledge on the behaviour of mercury above 100 deg. C. is based upon one of these papers published in 1890. In 1892, jointly with Professor Callendar, he issued a paper on the boiling point of sulphur, which formed the basis of all high-temperature thermometry.

Mr. E. A. Hollingsworth.—We regret to learn that Mr. E. A. Hollingsworth, superintendent of the Invoice Department of Callender's Cable and Construction Co., Ltd., passed away on March 5th. He was 52 years of age and had been with the company for 35 years.

Mr. T. Wray.—The death occurred suddenly at his Birmingham home on February 14th of Mr. Thomas Wray, who for many years past was electrical engineer surveyor attached to the Birmingham branch of the Eagle, Star and British Dominions Insurance Co., Ltd. He was previously electrical inspector with the Vulcan Boiler Insurance Co., Ltd., and with Messrs. Royce, Ltd., Manchester. The funeral was attended by representatives of the Eagle, Star and British Dominions Insurance Co., Ltd.

Mr. A. E. J. Ball.—The death occurred on March 1st, at Leicester, of Mr. A. E. J. Ball, who was in charge of the Clock Department of Messrs. Gent & Co., Ltd. He joined the company in 1905, and was responsible for many inventions relating to the electrical control of clocks. During his association with the company he travelled all over the British Isles to supervise the erection of clocks which he had designed. He was a fellow of the British Horological Institute, and was the author of many works on clocks, and the application of electricity to them. Our readers will remember that he contributed to the discussion on "Electric Clocks" in our "Correspondence" pages in December.

[Stanley, Leicester.
The late Mr. A. E. J. Ball

Will.—Mr. Robert Turner, of Messrs. Turner & Newall, Ltd., left £662,778 (net personalty £643,646).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

British N. S. F. Co., Ltd.—Private company. Registered February 24th. Capital £12,500 in £1 shares (3,000 10 per cent. cumulative preference and 9,500 ordinary). Objects: To adopt an agreement with Jacob Saemann, L. Saemann, Josef Saemann, Justin Saemann, and Hans Josef Saemann, and to carry on the business of broadcasters, transmitters and receivers of sound, pictures and signs, manufacturers and factors of and dealers in wireless, television and transmission apparatus, electrical apparatus, &c. The directors are:—C. R. D. Pritchett, J. Saemann, and Hans. J. Saemann, addresses not stated. Secretary: Miss B. M. McGratten. Registered office: Room 721, Bush House, Aldwych, W.C.2.

Wardon Manufacturing Co., Ltd.—Private company. Registered February 26th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio receiving and transmitting sets, wireless accessories and gramophones, electrical and wireless engineers, &c. The subscribers are: W. C. Youdan, 5, Lowden Road, Southall, and W. J. Ward, 69, Greenfield Avenue, Hanwell. Secretary: S. J. S. Parker, 162, High Street, Acton, W.

Electrochemical Installations, Ltd.—Private company. Registered March 3rd. Capital £1,000 in £1 shares (500 "A" and 500 "B"). Objects:—To carry on the business of manufacturers, importers and exporters of and dealers in electro-plating plants, etc. The directors are:—W. A. Burford, 6, Moreton Road, South Croydon, Surrey, and C. H. H. Cashman, 20, Lower Addiscombe Road, Croydon, Surrey. Registered office: 6, Moreton Road, South Croydon, Surrey.

Rayfac Radio, Ltd.—Private company. Registered March 4th. Capital £100 in £1 shares. Objects:—To carry on the business of manufacturers of, agents for and dealers in wireless, electrical and gramophone and photographic appliances and accessories, etc. The directors are:—E. W. Vernall, Tenace Villa, Brentwood, Essex, and J. S. Pritchard, 6, Cyprus Avenue, Church End, Finchley, N.3. Registered office:—22, Ely Place, Holborn Circus, E.C.1.

York Relay Services, Ltd.—Private company. Registered March 4th. Capital £4,000 in £1 shares (2,500 10 per cent. cumulative preference and 1,500 ordinary). Objects:—To carry on business as electrical, radio and general engineers, to establish stations for relaying radio entertainments, etc. The directors are:—S. Flowitt, 8, Windsor Road, Doncaster, and F. Netherwood, 47, Park Estate, Haxby, York.

Consolidated Industries (Great Britain), Ltd.—Private company. Registered March 4th. Capital £100 in £1 shares. Objects:—To carry on the business of wireless and electrical engineers and merchants, manufacturers of and dealers in all kinds of radio receiving sets, electric clocks, refrigerators, and other electric household appliances, etc. The subscribers are:—C. V. Booth and H. J. Wallis, both of 17, Victoria Street, S.W.1. Solicitors: Redden & Booth, 17, Victoria Street, S.W.1.

Fulstock Radio, Ltd.—Private company. Registered February 24th. Capital £500 in £1 shares. Objects:—To carry on the business of dealers in and manufacturers of gramophones or other sound-producing or musical instruments, radio, television and electrical apparatus, &c. The directors are:—W. H. Fuller, 23, Whitton Dene, Isleworth (managing director); and W. F. Hughes, 29, Cambridge Avenue, Greenford.

Fraser Radio, Ltd.—Private company. Registered February 25th. Capital £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in wireless apparatus or components, electrical apparatus, &c. The directors are:—R. E. Fraser, 22, Mildenhall Road, Clapton, E.5, and three others. Registered office: 38, Crawley Road, Wood Green, N.22.

Returns of Electrical Companies

Electrical Manufacturing & Plating Co., Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1931. All shares taken up. £300 considered as paid. Mortgages and charges: Nil.

Corwen Electric Light Co., Ltd.—Capital, £2,000 in £1 shares. Return dated November 17th, 1931. 1,610 shares taken up. £1,610 paid Mortgages and charges: Nil.

McGoff & Vickers, Ltd.—Capital, £2,000 in £1 shares. Return dated November 20th, 1931. 1,750 shares taken up. £1,750 paid. Mortgages and charges: Nil.

Alliance Radio, Ltd.—Particulars filed of debentures for sums not exceeding at any one time £350 authorised January 25th, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

W. Sitch & Co., Ltd.—Satisfaction to the extent of £200 on February 25th, 1919, of debentures authorised March 25th, 1909, and registered April 13th, 1909. Notice filed February 13th, 1932. (According to the register of mortgages, the debentures registered April 1st, 1909, originally secured £1,000.)

Coventry Electrical & Radio Services, Ltd.—Issue on February 5th of £100 debentures, part of a series already registered.

Warner's Radio, Ltd. (formerly Hudson Radio, Ltd.).—Particulars filed of £7,000 debentures authorised January 21st, charged on the company's undertaking and property, present and future, including uncalled capital, if any, the whole amount being now issued.

Watliff Co., Ltd.—Capital, £4,000 in 1,000 preference and 3,000 ordinary shares of £1. Return dated November 4th, 1931. 3,000 ordinary shares taken up. £2,880 paid, £100 considered as paid. Mortgages and charges, nil.

Eons Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated January 14th, 1932. All shares taken up. £500 paid. Mortgages and charges: £155.

Dixon & Sepulchre, Ltd.—Capital, £10,000 in 4,000 preference and 6,000 ordinary shares of £1. Return dated January 11th, 1932. 500 preference and 6,000 ordinary shares taken up. £6,500 paid. Mortgages and charges, nil.

Goldrick Electrical & Radio Co., Ltd.—Capital, £250 in £1 shares. Return dated November 9th, 1931. All shares taken up. £250 considered as paid. Mortgages and charges, nil.

Partridge & Mee, Ltd.—Charge on land, factory, &c., in Aylestone and land in Leicester, dated February 12th, to secure £3,000 and any other money due or to become due to the Leicester Permanent Building Society.

Bell Moulding Co., Ltd.—Issue on February 18th of £100 debentures, part of a series already registered.

F. J. Ashton, Ltd.—P. Phillips, 118/122, Great Portland Street, W.1, ceased to act as receiver on February 1st.

Ferguson Battery Co., Ltd.—Capital £3,000 in 5s. shares. Return dated January 13th, 1932. All shares taken up. £3,000 paid. Mortgages and charges: Nil.

Hewelectric Co., Ltd.—Capital £1,200 in £1 shares. Return dated November 16th, 1931. 500 shares taken up. £200 paid. £300 considered as paid. Mortgages and charges: Nil.

Franklin Electric Co., Ltd.—Capital £500 in £1 shares. Return dated November 18th, 1931. 270 shares taken up. £20 paid. £250 considered as paid. Mortgages and charges: Nil.

Everhot Electric Co., Ltd.—Capital £100 in £1 shares. Return dated January 19th, 1932. All shares taken up. £100 paid. Mortgages and charges: Nil.

City Notes

English Electric Co., Ltd.—The annual meeting was held on March 3rd, Sir Holberry Mensforth (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, March 4th, p. 364) the chairman said that, as compared with 1930, the past year was no better at home, and distinctly worse abroad. The changes in organisation had been put into effect and had been fully justified by the results. During the year they had completely closed the works at Coventry and transferred the manufacture of their special "Zed" fuse to Stafford. The manufacture of engineers' small tools had ceased, and the stocks were being disposed of. They had been responsible for the electrification of the Madras suburban lines for the South India Railway, and the service was officially inaugurated in April last. The London United Tramways, to whom they supplied thirty-five trolley-'bus equipments, inaugurated London's first trolley-'bus service in May of last year. They had also supplied a sample double-deck car having the largest seating capacity of any car ever built in this country for an important overseas tramway company. They had continued the development of their "on-load" transformer tap-changing gear, and had now installed this apparatus in connection with some 1,500,000 kVA. They had obtained an important order from abroad in consequence of the satisfactory behaviour of similar apparatus supplied by them for use in this country. They had been entrusted with the supply and erection of the heavy electrical equipment for the new steel works at Pretoria, and during the current year they would put into commission the third of their 30,000-kW turbo-alternators, running at 3,000 r.p.m. They were the first manufacturers to obtain a contract for a machine of this size running at so high a speed. The order position had been, and still was, very difficult. Any business offering was keenly competed for, and the market still continued almost entirely in the hands of the buyer. Owing to the general disturbance of the financial equilibrium during the latter half of last year, a severe restriction in the demand for heavy electrical machinery was experienced in many countries, and the normal demand for their products had received a setback. They were, however, receiving their share of such business as was offering. Their organisations in the Dominions and in foreign countries were ready to take advantage of any revival in the demand for their products. The outlook for 1932 was not encouraging. The requirements of the Central Electricity Board had been largely catered for, and its purchases during the current year were likely to be considerably smaller. The greater accessibility of electricity supply would create an increased demand for industrial electrical plant, more particularly switchgear and transformers, as well as motors; but it was doubtful whether this demand would be great enough, or arise promptly enough, to compensate manufacturers for the loss of orders for the larger equipment. The time lag between the availability of electricity supplies and the demand depended to a large extent upon business development, and there appeared to be no indications at the moment of an upward trend. They had taken steps during the year to equip themselves to deal adequately with these increased demands should they arise. They had developed a line of small turbines suitable for use where electricity in bulk was not available or could not be used. At Stafford and Bradford they had commenced the manufacture of small transformers and small switchgear, as well as domestic apparatus, such as radiators and cookers, as they considered that the demand for this type of apparatus must increase. Whilst it was essential for a company in the front rank of electrical manufacturers to undertake a certain amount of large and spectacular work, too much of this was not healthy at present prices; the engineering development and risk attending some of the large machines were inadequately paid for. They had arranged a licence with Siemens-Schuckertwerke whereby they were able to manufacture entirely in this country that company's mercury arc rectifiers. The work of equipping their Bradford workshops for the more economical manufacture of railway and tramway electrical machinery was now practically complete. The speaker expressed appreciation of the valuable help rendered to him, as chairman, by the representatives of the new interests introduced when the capital was reorganised. He also paid a tribute to the service given by the Westinghouse Co. of the U.S.A. as a result of the agreement for exchange of technical information. Their finances were sound, their resources were very liquid, their stocks and work in progress were low for a business of their type, and their manufacturing efficiency was high with resultant low costs, so they ought to be able to weather the storm as well as most.

The Midland Counties Electric Supply Co., Ltd., held its annual meeting on March 7th, Mr. George Balfour (chairman) presiding. In presenting the report and accounts the chairman said that before the 1926 Electricity Act was passed they had changed over the whole of their system in the Derbyshire and Nottinghamshire area from 25 to 50 cycles and bore the expense in the accounts spread over a series of years. In last year's accounts they wrote off the balance of this amount. Despite industrial depression their services continued to expand year by year and new connections not only overtook any drop in industrial demand, but caused a steady growth in output and revenue. Two customers alone last year showed a drop of 14 million kWh, but this decrease, in addition to a general falling off from industrial depression, was more than replaced by the miscellaneous demand of upwards of 8,000 new customers producing a better revenue per kWh. Regarding their transport properties they had changed over one system to trolley-buses during the year and would complete the organisation of the whole of the new system during the current year. Special Orders had been granted to the Leicestershire and Warwickshire Electric Power Co., relating to the East Leicestershire and Napton and surrounding district, and the whole area of that company was now covered by Special Orders. The Derbyshire and Nottinghamshire Electric Power Co. lodged application for two Special Orders relating to North Derbyshire and to an area immediately to the south of Buxton and these were still being considered by the Electricity Commissioners. During the year 8,607 consumers were connected and the total supplied directly by the operating companies at the end of 1931 was 41,860. The new connections for the first two months of the current year were in excess of the average monthly connections last year. They had laid and erected 273 route miles of new lines and now owned 1,038 route miles of e.h.p. lines and 866 route miles of l.p. distributors. They were now supplying consumers directly in three boroughs, 28 urban districts, and 311 parishes. Their sales amounted to 175,430,000 kWh, an increase of approximately 930,000 kWh, and the growth of their domestic consumers had a stabilising effect on their revenue. These consumers were encouraged by their two-part tariff, the hiring of apparatus and suitable propaganda. The connected load was 163,840 kW, an increase of 11,440 kW, and the maximum demand 62,700 kW, an increase of 5,300 kW. The extensions to the Spondon station were nearing completion and the new boilers, together with the new 30,000-kW turbo-alternator would be on commercial load during the present year. Mr. A. R. Holland in seconding the motion for the adoption of the report said that under the new tariff system it was more than fair to suppose that business generally in the Midland Counties would go bounding ahead. There were already favourable signs of that progress.

The Metropolitan Electric Supply Co., Ltd., held its annual meeting on March 9th, when Mr. G. Balfour (chairman), who presided, said they were able to record increased sales and revenue throughout the whole area directly supplied and the areas supplied by subsidiaries. The purchase of the Egham and Staines Electricity Co., Ltd., had been completed, and a reduction of ½d. per kWh had been made in the electricity charges. From the March quarter readings the fixed charge under their two-part tariff was to be reduced by 10 per cent., the domestic rate in the London area was to be reduced, and in the western area a reduction of ½d. per kWh for lighting (in Uxbridge 1d. per kWh) would be made. Referring to the London and Home Counties J.E.A., he said it must either be an independent and helpful authority or come out as an active competitor on equal terms. They resented this Authority making a levy upon them for its administration charges, and, at the same time, engaging, or arranging to engage, in active competition.

Mr. George Verity said that the new fiscal policy was promoting and encouraging the small manufacturer to become a power user upon whom the company relied to an appreciable extent. There was evidence that factories were springing up and that they would require electrical power in the very near future, and this would make up for the many factories which had been shut down as a result of "rationalisation."

Grosvenor Electric Batteries, Ltd.—At an extraordinary general meeting held on Wednesday a resolution to increase the capital to £250,000 by the creation of 200,000 new ordinary shares of £1 each was to be moved, and it was also proposed to capitalise £7,000, part of the undivided profits and distribute this as ordinary shares to the shareholders at the rate of one for every five held. In a statement issued by the secretary (Mr. J. M. Davies) it is stated that the company was formed in June, 1930, to take over the business of the Grosvenor Battery Co., Ltd., and Adie & Co., Ltd. From October, 1929, to June, 1931, the profits were £5,049, after writing off directors' fees and providing for income tax and the 6 per cent. cumulative preferred dividend. The accounts for the six months ended December 31st, 1931, were to be presented at the meeting. The statement says that the company's products have been sold in large quantities by retail stores and wireless manufacturers and great difficulty had been experienced in keeping abreast of the demand for batteries. More capital is needed to enlarge the factory, to meet increased demand and to produce component parts which have hitherto had to be purchased. The large increase in capital proposed as above is not for immediate issue. Proposals are being prepared for converting the preference into ordinary shares and if approved by shareholders these arrangements will give the company an issued and paid-up capital of £72,000, all in ordinary shares.

The London Electric Supply Corporation, Ltd., reports a profit of £143,381 for the year ended December 31st last, to which is added £54,793 brought in and interest from investments (£28,191). After deducting debenture discount (£1,163), the balance available is £225,203, as compared with £224,698 in 1930. It is proposed to transfer £7,866 to contingencies account, to transfer £64,157 to ordinary shareholders' benefit (sliding scale) fund, and to pay a final ordinary dividend of 5 per cent., making 9 2/15 per cent. for the year (against 9 per cent.), leaving £47,358 to be carried forward. The sales of electricity amounted to 275,782,205 kWh, as against 263,519,650 kWh. The ordinary capital has been increased by £150,000 to £1,000,000, and £174,825 of the reserves has been capitalised and distributed to ordinary shareholders in the proportion of one ordinary share for every four shares held. Meeting: March 15th.

The Telephone & General Trust, Ltd., reports a net revenue of £84,548 for 1931, as compared with £77,115 in the preceding year, to which is added £26,637 brought forward, making £111,185 available. The fixed dividend on the preference and preferred ordinary shares absorbs £56,894, and the dividend proposed on the ordinary shares is again 8 per cent., leaving £30,291 to be carried forward. During the year agreements were entered into with the State undertaking of Polish Posts and Telegraphs and Telephones whereby the Trust and the Automatic Electric Co., Ltd., have undertaken on credit terms the furnishing of automatic telephone equipment for the conversion of the Polish telephone network to automatic operation on the Strowger system. The agreements became effective in December last, and the equipment will be supplied by the Automatic Electric Co. over a period of six years, the credits amounting to £550,000. The report records the retirement of Mr. E. A. Mellinger from the board and the appointment of Mr. Rene Pleven to fill the vacancy. Meeting: March 15th.

The Mid-Cheshire Electricity Supply Co., Ltd., has announced a dividend of 1s. 6d. per share, less tax, on the ordinary shares (same).

The Bristol Tramways & Carriage Co., Ltd., reports a revenue for the year ended December 31st last of £1,175,544, as compared with £1,209,558 in the preceding year, and working and general expenses of £1,028,867, leaving, with the balance brought in, a net revenue of £151,722. A final ordinary dividend of 5 per

cent. is recommended, making 8 per cent. for the year (against 10 per cent.), leaving £4,880 to be carried forward. The report states that the receipts of the Tramways Department showed a decrease of £32,442, and those of the Carriage Department an increase of £946.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. reports a net revenue of £438,997, for 1931, as compared with £333,581 in the preceding year. To this is added other income and £77,695 brought in making £604,509. After deducting debenture interest, &c., it is again proposed to pay dividends of 8 per cent. on the "A" ordinary and 7½ per cent. on the "B" ordinary shares and to place £145,706 to reserve. The amount carried forward is £77,398. During the year to provide for development, 750,000 6 per cent. cumulative preference shares and 625,000 "B" ordinary shares were issued. Meeting: March 22nd.

The West Gloucestershire Power Co. reports revenue from the sales of electricity for 1931 of £122,359, an increase of £17,108. The net revenue was £31,580, from which is deducted an adverse balance at December 31st, 1930, of £12,712, and depreciation (£2,218). It has been deemed wise to write off all past depreciation (which is a non-recurring charge), amounting to £5,770, leaving £10,880, which has been transferred to reserve on account of depreciation. The electrical energy sold totalled 28,633,985 kWh, an increase of 4,866,687 kWh, as compared with the preceding year.

The Mid-Southern District Utility Co. held its annual meeting on February 25th, when Mr. R. W. Edwards (chairman and managing director), in the course of his speech, said that with regard to their Electricity Department the total advance in sales of electricity amounted to nearly 33 per cent. during the year as compared with the preceding year, while apparatus connected represented an additional load of 2,280 kW. They had a heavy programme in front of them with regard to the development of electricity.

The Companies Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Hindhead & District Electric Light Co., Ltd.
Knowsley Electrical Co., Ltd.
Maldon Electric Works, Ltd.
Young Accumulator Co., Ltd.

The names of the undermentioned companies have been struck off and they are thereby dissolved:—

Atlas Electrical Co., Ltd.
Midland Wireless Manufacturing & Supply Co., Ltd.
New Standard Wireless Valve Co., Ltd.

Charles Clifford & Son, Ltd., report a profit of £9,093 for 1931, and after deducting the amount written off for depreciation of investments (£3,025), and adding £35,139 brought in, there is £41,206 available. It is proposed to pay a final ordinary dividend at the rate of 10 per cent. per annum, leaving £33,407 to be carried forward. The report states that during the year the prices of most metals fell to unprecedented low levels, but some improvement subsequently took place.

The National Gas Engine Co., Ltd., reports a loss for 1931 of £15,086, as compared with a profit of £17,923 in 1930. This is deducted from a balance of £29,292 brought in, leaving £14,206. It is proposed to pay a final dividend on the preference shares at the rate of 5 per cent. per annum, less tax, and to carry forward £2,206. The report records the death of Mr. R. Bickerton, a director, and the election of Viscount Falmouth to the board.

The Marconi International Marine Communication Co., Ltd., reports gross receipts for 1931 of £771,183 as compared with £888,358 in the preceding year, to which is added £28,506 brought in making £799,689. After deducting salaries and general charges and £69,861 appropriated to depreciation it is proposed to pay a final dividend of 5 per cent., making 10 per cent. for the year (against 15 per cent.), leaving £25,228 to be carried forward.

W. Canning & Co., Ltd., report a profit of £45,444 for 1931, as compared with £52,937 in the preceding year, to which is added £15,014 brought in making £60,458. It is proposed to pay a final dividend of 7½ per cent., making 10 per cent., less tax, for year (same), to pay a bonus of 9d. per share, less tax (against 1s. per share, less tax), and to contribute £1,000 to the employés' benevolent trust fund. The amount carried forward is £16,020.

The Liverpool Overhead Railway Co. reports total receipts for the year ended December 31st of £76,473, as compared with £86,528 in 1930, and a surplus on the year's working of £517. After deducting debenture interest (£6,755) and adding a balance brought forward of £7,172, there is a balance at credit of revenue account of £934. The total number of passengers carried fell from 6,824,374 to 6,345,111.

The Allmänna Svenska Elektriska Aktiebolaget (A.S.E.A.) reports that after writing off 1.2 million kronor (£66,667) there is a net profit of 5.22 million kronor (£290,000) for 1931, against 5.37 millions (£298,333) for 1930. The board proposes to pay an unchanged dividend of 7 per cent. and to carry forward 0.44 million kronor (£24,444).

The Hendon Electric Supply Co., Ltd., reports that after meeting debenture interest, interim dividends, &c., there is a surplus for 1931 of £56,934. Repairs and renewals fund receives £14,378, general reserve £5,823, and tax account £5,000. A final distribution of 2s. per share, tax free, is proposed on the ordinary shares, leaving £18,386 to be carried forward.

The Elgin Electric Supply Co., Ltd., reports a balance for the year ended December 31st, with £1,380 brought in, of £4,743. It is proposed to pay a dividend of 7 per cent. on the 20,000 old shares for one year, and on 5,000 new shares for seven months, less tax, leaving £1,570 to be carried forward.

The Metropolitan District Railway Co. made an issue on March 3rd of £1,500,000 five per cent. redeemable debenture stock 1985/95, at 97½ per cent. The application lists were closed in the morning of the same day, and it was reported that the issue was very largely over-subscribed.

The Kidderminster and District Electric Supply Co. reports a net revenue of £6,282 for 1931. The ordinary dividend is maintained at 5 per cent., and £948 (£511) is carried forward.

Davis & Timmins, Ltd., report a net profit for 1931 of £6,350, to which is added income-tax balance (£189) and £16,329 brought in. After making provision for loss made by a subsidiary company and paying the preference dividend, £16,049 is carried forward.

Cables and Wireless, Ltd., announce that the estimated financial results for the year ending December 31st last do not permit of the declaration of any dividend for the year upon the 5½ per cent. cumulative preference stock.

The Canadian General Electric Co. has declared a dividend of $1 per share on the common stock for the quarter ending March 31st and a quarterly dividend of 1¾ per cent. on the preference stock.

The Metropolitan Railway Co., on Wednesday last, made an issue of £2,000,000 of 5 per cent. redeemable debenture stock, 1957-62, at 97½ per cent.

The Consolidated Gas, Electric Light & Power Co. of Baltimore has announced a quarterly dividend of $0.90 per share on the common shares.

The Kensington & Knightsbridge Electric Lighting Co., Ltd., is paying a balance dividend of 10.1811d. on the £1 ordinary shares, making the standard dividend for 1931 (1s. 7.1811d.).

The Midland Counties Electric Supply Co., Ltd., has declared a final dividend of 4½ per cent. on the ordinary shares, making 7 per cent. for the year.

Amalgamated Wireless (Australia) has announced an interim dividend at the rate of 7 per cent. per annum for the half-year ended December 31st.

The General Electric Co. (of New York) has reduced the quarterly dividend on the common stock from 40 cents to 25 cents per share.

Ward & Goldstone, Ltd., have declared the usual final dividend for the year on the cumulative preference shares at the rate of 7 per cent. per annum.

The Radio Corporation of America has deferred consideration of the dividend on the preferred "A" stock until March 4th.

The Pennsylvania Water & Power Co. has declared a quarterly dividend of $$\frac{3}{4}$$ per share on the common shares.

The North Staffordshire Tramways Co., Ltd., has announced a dividend of 5 per cent. on the ordinary shares for 1931 (same).

Stocks and Shares

TUESDAY EVENING.

THE financial atmosphere of the Stock Exchange markets has changed dramatically during the past three weeks. Why the alteration should have occurred it is difficult to catalogue in the course of a paragraph. Various causes have been at work, of which the chief is undoubtedly the increasing ease in the money market, and the greater willingness shown by America to unfreeze part of the gold and of the credit that have been locked up in the States for so long a time. Quiet inquiry for stocks and shares has suddenly swollen into a clamant demand, to meet which the supplies available in the markets have proved inadequate. It is not only gilt-edged stocks that have responded to the better feeling; the shares in such industrial companies as British Insulated, Callender's, Henley's and others of this character have advanced substantially from the lowest prices touched only a few weeks ago. The change in sentiment has affected practically all the markets. Even amongst rubber shares a better tendency has become discernible.

Flight to the £

On top of this money boomlet has come a flight from dollar and from franc. British currency has come all at once into favour. The sovereign is up to 75 per cent. of the gold standard value, and the investor, bewildered at the kaleidoscopic changes, falls back on Chevalier and cries "'e dunno where 'e are." Pessimism is, however, at a heavy discount, and there is a distinct pleasure in being able to chronicle such a change of sentiment as our price lists reflect in this current number.

District Debenture

The Metropolitan District issue of 5 per cent. redeemable debenture stock was subscribed some twenty times over. Applicants received microscopic allotments. The price of issue, 97½, evidently tempted investment as well as speculation, and a premium of 2⅛ has been established. The Central Electricity 5 per cent. scrip, recently issued at 95, and left as to 80 per cent. in the hands of the underwriters at that time, after its fall to 2¼ discount is now up to 4¼ premium. Home Railway prior-charge stocks have been taken with avidity. The Metropolitan Railway is offering £2,000,000 five per cent. debenture at 97½, and it is likely that the offer will be oversubscribed. The security is not so good as that of the new Metropolitan District debenture, but is considered to be sufficiently sound to warrant its attracting the consideration of the investor.

Cables and Wireless

The announcement that Cables and Wireless, Limited, would not pay any dividend on the 5½ per cent. preference stock in respect of the year ended December 31st last came as a surprise and a disappointment. Rumour had been busy, a couple of days prior to the announcement, canvassing the likelihood of at least 3 per cent. being distributed, and the official statement caused an abrupt fall in the price of the stock from 51 to 44. Upon bear repurchasing, and the consideration that

the dividend is cumulative, the price recovered to 47½, at which it shows a small rise on the week. The two ordinary stocks are also better, and rumour, not to be quenched by the unfortunate outcome of its last week's venture, now reports that the traffic return for February is likely to prove exceptionally good. Marconi Marine has reduced its dividend from 15 per cent. to 10 per cent. for last year, and in consequence of this the shares fell to 30s. Anglo-American Telegraph stocks have participated in the strength shown by investments as a whole. Great Northern Telegraphs are 30s. higher at 24. American Telephone and Telegraph, after a substantial rise, reacted to its previous price of 185. Internationals at 14 are down 1½ upon apprehension as to what the next dividend announcement may be.

Home Electricity Supply

The list of prices in the home electricity market shows an almost unbroken series of gains. The advance is due to the monetary conditions which prevail, and which have, as already noted, caused such substantial improvements in the quotations for practically all investment securities. County of London ordinary have recovered the florin shed last week. Electrical Distribution of Yorkshire shares are ½ up at 35s. and Electric Supply Corporations are equally better at 2½. Reference to the list will show the remarkable unanimity of movement. The preferences have advanced along with the ordinary, and shares are so tightly held by the proprietors as to be far from easy to obtain.

Provincial Progress

The West Gloucestershire Power Company, which last year showed an adverse balance of £12,700, has turned this into a credit of £10,800, after making allowance for all past depreciation. The latter amount has been transferred to a reserve on account of depreciation. The price of the 5½ per cent. first mortgage sinking fund debenture stock has risen to 102. The 6½ per cent. participating preference is better at 76¼. The Midland Counties Electric Supply Company, as the chairman showed at the meeting on Monday in this week, is going ahead in an encouraging fashion, and has gained new subscribers in a manner that more than counteracted the loss of a bulk supply contract.

Mexican Matters

One of the outstanding features amongst foreign stocks is the way in which Mexican issues have suddenly come to life. Once more, as in the past, there is little less than rumour to account for the demand which has brought about so considerable a jump in the prices of Mexican utility shares. The country is said to have turned the long lane of depression and to be emerging from the somnolence which has cast a gloom over the investment and speculative securities connected with Mexico. Mexican Light and Power first mortgage bonds are 15 points higher at 77½. The 7 per cent. preferred shares are up 10 points, and the common at 27½ show a gain of 5. Mexican Tramways 5 per cent. bonds at 41½ are 6 points to the good. The same conditions, though in scarcely such dramatic manner, apply to Mexican Government issues. Part of the buying has come from New York, and part from Montreal; there has been a little local speculation on this side to supplement the support. Of other Latin-Canadian stocks, Brazilian Tractions stand out as the most active, and the price, at 18, is ¼ lower on the week.

Manufacturing and Equipment

Henley's, which rose 5s. last week, are again a similar amount higher, at 5½. British Aluminium gained 3/16, British Insulated and Callender's both 5s. 6d. each, Enfields and Siemens ¼, and the 6½ per cent. preference 1s. General Electrics 1/16. Associated Electrical Industries ordinary are a florin better. English Electric shares continued to reflect the remarkable profit recovery exhibited in the last report. The ordinary and preference were both 1/16 higher at 10s. Ever-Ready shares have risen 3s. to 24s. 9d. It may be noticed that Brush ordinary has not moved from 60. Amongst iron and steel shares the tone has been a little less decided. Babcock and Wilcox went up sharply, but Vickers, after a rise to 8s. 6d., reacted to 7s. 9d. The rise in the value of sterling had the effect of crying a halt throughout the Stock Exchange markets for ordinary shares, though at the same time it confirmed the strength shown by gilt-edged securities and other stocks affected by the value of money.

Home Railways

Central London assented ordinary stock is 3 points to the good at 69½. The ordinary stocks of the Metropolitan and the Metropolitan District are easier, upon the placing in front of them of the new debenture stocks already mentioned. Underground Electric shares have rallied to 19s. Provisional dates are announced for the opening of the extensions on the Piccadilly Railway. When these extensions are completed, the whole scheme will have cost twelve million pounds sterling, and provided work, directly and indirectly, for 24,000 men.

British Electric Traction deferred has held its spectacular rise of 225 points in a fortnight. The preferred stock is 6 up, at 118½. American utilities are easier on account of the decline in the value of the dollar as compared with the £. The rise in sterling diminishes, of course, the advantage which British exporters receive, through the rate of exchange, in those countries that remain on the gold standard.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. Mar. 8.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	15	15	60/9	+⅛	4 18 9
Brompton Ordinary	1	8½	8½	26/6	+6d.	5 5 8
Central Electricity 4½% Deb.	Stock	4½	4½	92½	+1½	4 17 4
Charing Cross Ordinary	1	8½	8½	29/–	+6d.	4 16 7
Chelsea	1	8½	8½	25/6	—	5 9 10
City of London	1	10	10	35/9	—	5 12 0
Clyde Valley	1	8	7	30/–	+⅛	4 15 0
County of London	1	11	10½	44/6	+2/–	4 14 5
Edmundsons' 7% Pref.	1	7	7	24/6	+1/–	5 14 2
Elec. Dis. Yorkshire	1	9	9	35/–	+½	5 2 10
Elec. Supply Corporation	1	11	—	45/–	+½	4 17 9
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	6½	—	24/6	+9d.	5 6 1
London & Home Counties 4½% Deb.	Stock	4½	4½	92	+1	4 17 10
London Electric	1	9	9	27/6	+6d.	5 1 10
Metropolitan	1	10	10	41/3	+1/9	4 17 0
Midland Counties	1	7	7	28/9	+6d.	4 17 5
Mid. Elec. Power	1	8	8	28/9	+⅛	5 11 5
Newcastle-on-Tyne Ordinary	1	6	6	24/6	—	4 18 0
Do. 7% Pref.	1	7	7	26/–	—	5 7 8
Northampton	1	10	10	38/3	—	5 4 7
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	23/6	+6d.	5 2 2
St. James' and Pall Mall	1	8	8	29/6	+6d.	4 15 0
Scottish Power	1	8	—	28/9	+1/9	5 11 4
South London	1	8½	8½	26/6	+1/–	5 5 8
Urban Ordinary	1	7	—	27/6	+6d.	5 1 10
Westminster Ordinary	1	8½	8½	26/–	+6d.	5 7 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.	1	8	8	33/–	+6d.	4 17 0
HOME RAILS						
Central London Ord. Assented	Stock	4	4	69½	+3	5 15 2
Metropolitan	„	4	3½	34½	–1	10 2 10
Do. District	„	5	4½	53½	–1	8 8 2
Underground Electric	1	8	7	19/–	+6d.	7 7 4
TELEGRAPHS AND TELEPHONES.		1929.	1930.			
American Tel. & Tel.	$100	9	9	185	—	4 17 3
Anglo-Am. Tel. Pref.	Stock	6	6	95	+3	6 6 4
Do. Def.	„	1½	1½	22	+1	6 16 4
Cables & Wireless 5½% Pref.	„	5½	5½	47½	+1	—
Do. A 7½% Ord.	„	Nil	—	16	+1	—
Do. B Ord.	„	Nil	—	10	+½	—
Globe Tel. and T. Ord.	10	10	8½	5½	—	—
Do. do. Pref.	10	6	6	7	+½	8 11 6
Great Northern Tel.	10	20	20	24	+1½	8 6 8
Marconi-Marine	1	15	15	30/–	–⅛	6 13 4
Oriental Telephone Ord.	1	12	12	2⅛	—	*5 16 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Prcf.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	16½	—	—
British Electric Traction Def. Ord.	„	5	5	875	—	—
Do. do. Pref. Ord.	„	8	8	118½	+6	6 15 0
Brazil Traction	100	8	—	18	–¼	5 11 1
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	87½	+5	5 14 3
London & Sub. Trac. 5% Pref.	1	Nil	Nil	7/–	—	—
London United Tram Deb.	Stock	4	4	55½	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	41½	+6	12 1 0
Mexican Light Common	100	Nil	Nil	27½	+5	—
Do. 7% Pref.	100	7	7	40½	+10	17 5 9
Do. 1st Bonds	—	5	5	77½	+5	6 9 0
Victoria Falls Ord.	1	15	15	59/6	+3/3	5 0 10
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	23/3	+2/–	5 3 3
Do. Pref.	1	8	8	27/–	+9d.	5 18 6
Babcock & Wilcox	1	15	14	47/–	+3/3	*5 19 2
British Aluminium Ord.	1	10	10	28/9	+⅛	6 19 2
British Insulated Ord.	1	15	15	58/9	+5/6	5 2 2
Brush Ord.	Stock	10	5	60	—	8 6 8
Callender's	1	15	15	58/9	+5/6	5 2 2
Do. 6½% Pref.	1	6½	6½	22/6	—	5 15 5
Crompton Parkinson Ord.	5/–	30	30	18/9	—	8 0 0
Do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	4	+½	6 5 0
English Electric	1	Nil	Nil	10/–	+⅛	—
Do. do. Pref.	1	Nil	Nil	10/–	+⅛	—
Ever Ready	5/–	35	35	24/9	+3/–	7 1 5
Ferranti Pref.	1	7	7	20/9	—	6 15 0
G.E.C. Pref.	1	6½	6½	24/6	+1/–	5 6 1
Do. Ord.	1	14	10	43/9	+⅛	4 11 5
Henley's	1	30	30	5½	+½	5 9 1
Do. 4½% Pref.	5	4½	4½	4½	—	5 9 1
India-Rubber	1	Nil	Nil	5/9	—	—
Johnson & Phillips	1	10	10	22/6	–⅛	8 17 9
Siemens Ord.	1	7½	7½	23/9	+½	6 6 4
Telegraph Construction	12	10	7½	10	—	—

* Dividends paid free of Income Tax.

Published Specifications

COMPILED expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

23,479. "Radio-telegraphic direction finding and direction indicating devices employing an ionic beam." R. A. Watt, L. H. Bainbridge-Bell, and C. Chaffer. August 5th, 1930. (Cognate application 13,925/31.) (366,989.)

23,705. "High tension electric switches." F. Windhausen. August 7th, 1929. (366,945.)

23,827. "Electric motors." Sangamo Electric Co. June 2nd, 1930. (366,946.)

27,320. "Electric circuit breakers." British Thomson-Houston Co., Ltd. September 12th, 1929. (366,966.)

27,321. "Methods of and means for effecting reproduction from successive sound and motion picture records." British Thomson-Houston Co., Ltd. September 12th, 1929. (366,967.)

29,769. "Windings for d.c. dynamo armatures. J. Pintsch Akt.-Ges. October 10th, 1929. (366,929.)

30,228. "Safety lightning discharge switch for wireless apparatus." F. E. Harmer. October 9th, 1930. (366,913.)

30,920. "Electric circuit breakers." British Electrical and Allied Industries Research Association, W. B. Whitney, and E. B. Wedmore. October 15th, 1930. (Cognate application 20,971/31.) (366,998.)

32,855. "Electric gas blast switches." International General Electric Co., Inc. October 31st, 1929. (366,949.)

33,271. "Dynamo-electric machines." Aktiebolaget Ljungstroms Angturbin. December 13th, 1929. (366,950.)

33,284. "Electrical resistance devices." E. N. Lightfoot. February 19th, 1930. (367,004.)

33,369. "Electric signalling or remote control systems." Standard Telephones & Cables, Ltd., and J. B. Griffiths. November 6th, 1930. (366,919.)

33,370. "Thermionic amplifying devices." Standard Telephones & Cables, Ltd., and V. J. Terry. November 6th, 1930. (366,920.)

33,560. "Secret signalling systems." Electrical Research Products, Inc. November 8th, 1929. (366,921.)

33,601. "Thermo-electromagnetic devices for limiting current intensity." F. Esteve. November 7th, 1930. (367,007.)

33,609. "Thermionic valves." Marconi's Wireless Telegraph Co., Ltd., and H. Caswall. November 7th, 1930. (366,954.)

33,612. "Telephone transmitters." Siemens Bros. & Co., Ltd., and W. E. Goodwin. November 8th, 1930. (Cognate application 22,691/31.) (366,955.)

33,823. "Electron discharge amplification systems." J. H. Hammond, Jun. November 12th, 1929. (366,937.)

33,968. "Electric contactor." H. Fawcett and Associated Electrical Industries, Ltd. November 11th, 1930. (366,981.)

33,969. "Electric clocks and phonic motors." R. P. Howgrave-Graham. November 11th, 1930. (367,012.)

34,123. "Electric kettles or like vessels for heating liquids." Automatic Telephone Manufacturing Co., Ltd., and C. H. Archer. November 12th, 1930. (366,986.)

34,239. "Synchronous telegraph or like system." Electrical Research Products, Inc. December 4th, 1929. (367,019.)

34,313. "Vacuum-tube circuits." Electrical Research Products, Inc. December 31st, 1929. (367,022.)

34,460. "Electrically driven tuning forks." G. Priechenfried and British Radiostat Corp., Ltd. November 15th, 1930. (367,035.)

35,176. "Electron-discharge amplification systems." J. H. Hammond, Junr. November 23rd, 1929. (Addition to 366,937.) (367,056.)

35,317. "Formation of stranded electric cables." Siemens Bros. & Co., Ltd., and A. Rosen. November 24th, 1930. (367,058.)

36,031. "Control and protection of electrical apparatus." British Jeffrey-Diamond, Ltd., and H. Tinsley. November 29th, 1930. (367,065.)

36,406. "Boxes for containing electric switches fuses and the like." J. A. Crabtree. December 3rd, 1930. (367,071.)

37,293. "Electric insulating materials." Edison Swan Electric Co., Ltd., and F. Shergold. December 10th, 1930. (367,080.)

37,808. "Ammeters." Weston Electrical Instrument Corporation. October 30th, 1930. (367,085.)

1931

985. "Gas-blast electric switches." S. Ruppel. January 16th, 1930. (367,115.)

1,612. "Electrical resistance elements for use in the measurement of radiant energy." M. Buchholz. January 17th, 1931. (367,125.)

2,073. "Controllers for electric motors and the like." International General Electric Co., Inc. January 21st, 1930. (Addition to 356,104.) (367,133.)

2,180. "Incandescent electric lamp for motor-car headlights." W. Albers. November 3rd, 1930. (Addition to 1,554/31.) (367,135.)

2,932. "Insulated electric conductors." A. F. Bulgin. January 29th, 1931. (367,145.)

3,088. "Electrical condensers." F. P. Burch and Associated Electrical Industries, Ltd. January 30th, 1931. (367,147.)

3,187. "Thermionic vacuum tubes or valves, and arrangements for limiting, amplifying, detecting, rectifying, or other purposes." W. B. Mackenzie and H. R. Cantelo. January 31st, 1931. (367,150.)

3,223. "Electrically driven vehicles." S. S. Guy and Guy Motors, Ltd. February 2nd, 1931. (367,151.)

3,920. "Bearings for armature shafts of electric motors and dynamos." British Timken, Ltd., and F. Wood. February 7th, 1931. (367,164.)

4,038. "Luminous electric discharge tubes." General Electric Co., Ltd. March 5th, 1930. (367,166.)

5,282. "Electric contacts." British Thomson-Houston Co., Ltd. February 19th, 1930. (367,178.)

5,525. "Electric water-heaters." D. G. Petrie and Young, Osmond & Young, Ltd. February 21st, 1931. (367,181.)

5,831. "Ignition switch and battery saver for use with internal-combustion engines having electrical ignition." E. V. Summersgill. February 25th, 1930. (367,185.)

6,092. "Electric circuit controlling devices." British Thomson-Houston Co., Ltd. February 28th, 1930. (367,189.)

6,233. "Electric measuring instruments." Weston Electrical Instrument Corp. January 12th, 1931. (367,191.)

8,483. "Radio apparatus employing neutralised valve stages." C. Lorenz Akt.-Ges. April 28th, 1930. (367,212.)

8,608. "Telephone receiver supports or brackets." Barringtons (Designers), Ltd., J. H. Bennett, and J. H. Agar. March 20th, 1931. (367,214.)

9,358. "Electrical tuning apparatus." L. W. Fillmore and L. E. Fillmore (trading as Jackson Bros.). March 27th, 1931. (367,219.)

10,080. "Transformers for electric arc welding cutting and like purposes." C. J. Holdslag. April 2nd, 1931. (367,224.)

10,317. "Diesel electric locomotives.' Sulzer Frères Soc. Anon. May 8th, 1930. (367,228.)

10,663. "Eddy-current speed indicators and recorders." W. J. Tennant (Deuta-Werke vorm Deutsche Tachometer-Werke Ges.). April 10th, 1931. (367,232.)

12,771. "Electric motor control systems." British Thomson-Houston Co., Ltd. April 30th, 1930. (367,243.)

13,094. "Supply of a direct current electromagnet from an alternating-current source." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). May 4th, 1931. (367,245.)

13,282. "Electrical registering or recording device for weighing apparatus." J. H. W. Siebers. May 5th, 1931. (367,247.)

14,979. "Tubular electric heaters." Credenda Conduits Co., Ltd., and P. W. Davis. May 21st, 1931. (367,259.)

16,203. "Electric switches of the tumbler type." A. F. Bulgin and H. J. Smith. June 4th, 1931. (367,266.)

16,376. "Plug-in point for electric current." C. Rode-Stucky. June 7th, 1930. (367,267.)

16,417. "Safety appliances for electrically heated apparatus." Bulpitt & Sons, Ltd., and W. H. Bulpitt. June 5th, 1931. (Addition to 329,406.) (367,268.)

16,775. "Luminous electric discharge tubes." General Electric Co., Ltd. July 26th, 1930. (367,271.)

18,024. "Aerial arrangements for use on submarines." Telefunken Ges. für Drahtlose Telegraphie. June 21st, 1930. (367,278.)

19,150. "Radio direction and bearing finding systems suitable for use in connection with navigation." Telefunken Ges. für Drahtlose Telegraphie and W. Ludenia. July 2nd, 1930. (367,286.)

22,184. "Electric discharge tubes.' Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 27th, 1930. (367,300.)

24,019. "Electric circuits for shifting the phase of an alternating potential." British Thomson-Houston Co., Ltd. August 27th, 1930. (367,306.)

24,020. "Means for shifting the phase of alternating-current circuits." British Thomson-Houston Co., Ltd. August 27th, 1930. (367,307.)

25,201. "Luminous electric discharge tubes." General Electric Co., Ltd. September 12th, 1930. (367,309.)

25,841. "Electron discharge tubes." E. A. Fritz. September 20th, 1930. (367,310.)

29,311. "Electric switches for the prevention or extinction of fire on aircraft." R. A. Blakeborough and R. A. Denne. January 22nd, 1931. (Divided application on 2,225/31.) (367,314.)

30,483. "Electric motors." H. J. Heasman. November 4th, 1930. (Divided application on 33,087/30. (366,942.)

30,484. "Electric gramophone motors." H. J. Heasman. November 4th, 1930. (Divided application on 33,087/30.) (366,943.)

32,833. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., R. Taylor, and C. E. Beale. November 7th, 1930. (Divided application on 33,581/30.) (366,959.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 2nd:—

Tempo (lettering and design). No. 516,786. Class 6. Electric starting and ignition machinery, dynamos and electro-motors, and parts thereof, &c.—Vidal & Sohn, Hamburg. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Edac; At Your Service (lettering and design). No. 528,356. Class 6. Electric fans, hair-drying machines, vacuum cleaning and floor polishing machines.—C. H. Twigg, trading as the Electric Domestic Appliance Co., 6, Kingstanding Road, Perry Barr, Birmingham.

Mavis. No. 526,777. Class 8. Radio-telegraphic and telephonic apparatus, sound reproducing apparatus, &c.—County Electrical Co. (Pendleton), Ltd., Broad Street, Pendleton, Manchester.

Harlequin. No. 527,640. Class 8. Radio receiving sets.—Hedingham Radio, Ltd., Swan Street, Sible Hedingham, Essex.

CovRadio (lettering and design). No. 528,476. Class 8. Radio-telegraphic and telephonic apparatus and parts thereof.—A. Granville, Ltd., Colindale Avenue, Hendon, N.W.9.

Polrad. No. 528,951. Class 8. Radio-telegraphic and telephonic apparatus.—M. A. Polchar, trading as the Polrad Manufacturing Co., Giffin Street, Deptford, S.E.8.

Dajen. No. 529,353. All goods in Class 8.—Electric Thermic Development Co., Ltd., St. Stephen's House, Westminster, S.W.1.

Hedralite. No. 525,836. Class 13. Illuminating fittings and parts.—Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.

Telconite. No. 529,188. Class 4. Goods manufactured from india-rubber and gutta-percha.—Telegraph Construction and Maintenance Co., Ltd., 38, Old Broad Street, E.C.2.

Glazite. No. 527,813. Class 50. Tubing or sleeving made principally of cellulose for use as a covering or insulation for wire and for cable for electrical purposes.—London Electric Wire Co. & Smiths, Ltd., 7, Playhouse Yard, Golden Lane, E.C.1.

Durameg. No. 529,002. Class 50. Electrical insulating varnish.—Hadfield's (Merton), Ltd., Western Road, Mitcham, Surrey.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Houses (24); borough surveyor.

Alford (LINCS).—Hotel, Anderby Creek (£25,000); Miss Phœbe Jukes, Shirecliff Hall, Sheffield.

Barnoldswick (LANCS).—Church (£20,000); R. Martin, surveyor, 90, Deansgate, Manchester.

Bedfordshire.—Mental colony for 260 patients, Bromham; Beds & Northants County Councils.

Bexhill.—Houses (various districts); J. E. Maynard, architect, Collington Avenue.

Birkenhead.—Re-erection of dock headquarters, Blue Funnel Line; Alfred Holt & Co.

Birmingham.—School, Yardley Road; E.C.

Blackwell.—Houses (26), Scarcliffe, for R.D.C.; H. T. Sudbury, architect, Lord Haddon Road, Ilkeston.

Blackpool.—Housing scheme, Hodgson Estate; R. B. Hodgson, 2, Blackpool Road, Bispham.

Blyth.—Houses, Princess Louise Road (100) and Bebside (50); borough surveyor.

Bolton.—Housing scheme (83), Cameron Street site; W. Townson & Sons, Ltd., builders, Park Hill Saw Mills. Houses (26), East Bank Estate, Doffcocker; J. H. Sharples. Houses (80), Cameron Street Estate; William Townson & Son, Ltd.

Catford.—Houses (144), Perry Hill Estate; L. A. Culliford. Houses, Beacon Road; Godfreys Properties and Flats, Ltd.

Chesterfield.—Houses for the T.C.; G. Rowley (46) and Walters & Westley, Ltd. (28), builders. Waterworks (£90,000); R.D.C. surveyor.

Chester-le-Street.—Rehousing scheme, Birtley; R.D.C. surveyor.

Cleator Moor (CUMBERLAND).—Houses, Birks Road site (100); U.D.C. surveyor.

Croydon.—Shops and stores, High Street and Lower Coombe Street; Hooker & Rogers, architects, 4, High Street. Re-erection of works, Addiscombe; Basebe, Sadler & Co., Ltd., Morland Works. School (£3,000); trustees, Croydon Congregational Church.

Dagenham (ESSEX).—Licensed premises for Mann, Crossman and Paulin, Ltd., and Courage & Co., Ltd.

Darlington.—School, &c., Pierremont; H. B. Richardson, architect, 3, Skinnergate, Darlington.

Dewsbury.—Parish hall, Altofts, near Normanton, for the Reverend W. E. Knifton; C. H. Marriott, Son & Shaw, architects, Church Street Chambers.

Doncaster.—School, Wheatley, for the borough E.C.; director of education.

Dudley.—Church, Lime Pit Lane; Methodist Church Group. Church, Laurel Road; Worcester Diocesan Board.

Dumfries.—Houses (104); James Barbour & Bowie, architects. Houses, Pent House End (electrical work); John Barker, borough surveyor.

Dundee.—School (£12,500); Allan & Friskin, architects.

Dunoon.—Alterations to Glenmorag Mansion House (£3,250); J. McNair, architect, Kirn.

Eastbourne.—Cinema, North Street and Pevensey Road, for Mr. Bentley; J. Stanley Beard & Clare, architects. Cinema, Gildridge Road and West Terrace; W. T. King, architect. Cinema, Langley Road; P. D. Stonham & Son, architects.

Eccles (LANCS).—Houses (100); borough surveyor.

Edinburgh.—Houses (318); city architect. Houses (£120,000); James Miller, builder, 88, Hanover Street. Shops and offices, Groathill Road and West Barnton Terrace; Elder & Wilson, builders, Craigleith Road.

Essex.—Schools, South Chingford, for the county E.C.; J. Stuart, county architect, Chelmsford.

Finchley.—School, Summers Lane; E.C.

Fordingbridge (HANTS).—Houses (32); R.D.C. surveyor.

Glasgow.—Buildings at Lennox Castle (£200,000); city engineer and trade contractors. Houses (1,054), East Keppoch (£500,000), and Garngadhill; city architect. Extensions, Glasgow Eye Infirmary (£19,000); Sir Matthew Montgomery, chairman of directors.

Glossop.—Extensions to works of the Glossop Glove Company, Ltd., George Street; Henry Green & Sons, builders, Stocks Farm, Cheetham Hill Road, Manchester.

Gravesend.—Houses (176) and flats (12), Denton Estate; J. G. Bennett, borough architect, 5, Woodville Terrace.

Halifax.—Extensions to mill premises for Patons & Baldwins, Ltd., Clark Bridge Mills; Clement Williams & Sons, architects, Permanent Chambers, Commercial Street.

Hounslow.—Business premises with flats, Spur Road; Robinson & Roods, architects, 37, Bedford Row, W.C.1.

Irish Free State.—(DROGHEDA, CO. LOUTH).—Houses (55), for Corporation. (BALLYDEHOB, CO. CORK).—Dispensary, for West Cork Board of Health; J. J. O'Crowley, architect, Clonakilty, Co. Cork.

Isle of Axholme.—Houses (22); R.D.C. surveyor.

Keighley.—Restaurant, High Street; Wild & Atkinson. Houses (25), Colenso Way; W. & H. Whitaker.

Kelso.—Conversion of church into picture house (£4,000); J. P. Allison and Hobkirk, architects, Hawick.

Kettering.—Shops and houses, Rushton Road, Desborough; Henry Marlow & Sons, builders, Station Road, Desborough.

Kirkconnel.—Pithead baths, Fauldhead Colliery; Angus MacDougall, Davaar Street, Glasgow.

Lanarkshire.—Houses (20), Shettleston (electric lighting), for C.C.; P. C. Smith, architect, 13, Clydesdale Street, Hamilton.

Leeds.—Reinstatement of woollen mill; F. A. Lodge & Sons, Winker Green Mills, Armley, Leeds.

Leicester.—R.C. school, for St. Peter's; rector.

Leigh (LANCS).—Schools (£16,000); Rev. J. E. Eastwood, Leigh Parish Church.

London.—(BERMONDSEY).—Three blocks of 34 tenements, Crosbie Row site (£20,000); works manager. (EDMONTON).—Cinema, Silver Street; Clifford A. Aish, architect, 22, Bedford Street, W.C.2. (ELTHAM).—St. Saviour's Church, Middle Park Estate; Bishop of Woolwich. (WEST HAM).—Additions to offices, Factory Road, for Tate & Lyle, Ltd.; Geo. N. Kent, architect, 521, Barking Road, Plaistow, E.13. (GOLDERS GREEN). Church, North End Road and West Heath Drive; vicar of St. Alban the Martyr.

Malling (KENT).—Houses (40); R.D.C. surveyor.

Malvern.—Houses (50) for the U.D.C.; F. Hill-Roberts, Ledbury, and F. J. Hill, Inglehope Works, Malvern, builders.

Manchester.—Two schools and library, Wythenshawe Estate; city architect.

Newcastle-on-Tyne.—Presbyterian Church, High Heaton; trustees. Institute, Pendower Estate; J. S. Hetherington, builder, 21, Benwell Grove. Cinema, Pridhoe Street; Festival Halls, Ltd.

Newport (MON).—Reconstruction of hotel premises, Chepstow Road, for Phillips & Sons, Ltd.; Swalwell, Havard & H. E. Sheppard, architects, 8, Pentonville.

Newton Abbot (DEVON).—Church, Milber (£7,000); incumbent. Alterations and improvements to Commercial Hotel; Architects' Department, H. & G. Simonds, Ltd., Tamar Brewery, Devonport.

Northampton.—Houses (28), Greenfield Avenue; S. G. Sale & Co. Shops and offices, Lower Mounts; Northampton Town & County Benefit Building Society.

Northern Ireland (DUNGANNON).—Hospital (£23,000) for R.D.C.

Northwich.—Extensions, St. Wilfrid's R.C. school; managers.

Oakengates (SALOP).—Houses (20); U.D.C. surveyor.

Paignton (DEVON).—Houses (41); U.D.C. surveyor. Cinema; W. B. Couldrey & Son, architects, 19, Palace Avenue.

Peterborough.—Houses (187); borough surveyor.

Plymouth.—Second section, mental hospital extension (£40,000); city architect.

Pontefract.—Waterworks pumping plant (£40,000); borough engineer.

Portland.—Cinema, Fortune's Well, for J. Herbert, Hounslow; Andrews & Andrews, architects, London.

Portsmouth.—Senior schools (£11,688), Portsdown, for the borough E.C.; W. J. Nightingale & Son, builders, Liss. School, Cosham, for the borough E.C.; director of education.

Pulborough.—R.C. church; parish priest.

Purley (SURREY).—Extensions, War Memorial Hospital, Brighton Road; Thompson & Walford, architects, Leadenhall Buildings, Leadenhall Street, E.C.3.

Radcliffe (LANCS).—Bakery for the Radcliffe & Pilkington Co-operative Society, Ltd.; William Rigby (1920), Ltd., builders, Radcliffe Saw Mills.

Rotherham.—Houses (150); R.D.C. surveyor.

Rowley Regis.—Houses (42), Dudley Road; U.D.C. surveyor, Council Offices, Old Hill, Staffs.

St. Austell (CORNWALL).—Additional housing scheme; U.D.C. surveyor.

Salford.—R.C. church, All Souls' Parish, Weaste; Rev. Dean L. Delaney.

Seaford (SUSSEX).—Hotel (£5,000), for Rock Brewery, Ltd., Brighton; A. Underdown, architect, Lloyds Bank Chambers.

Sheffield.—Houses (100), Totley Estate; city architect.

Shoreham (SUSSEX).—Houses (90); U.D.C. surveyor.

Smethwick.—Hospital extensions (£6,000); borough engineer.

Southall.—Houses (24), Greenland Crescent; General Housing Co., Ltd. Houses (47), Ascot Gardens; G. Wimpey & Co.

South Shields.—Conversion of Horsley Hill football ground into greyhound track; G. Lorraine Smith.

Stourbridge.—Rebuilding of the Mitre Hotel, High Street; Scott & Clark, architects, Regent Chambers, Wednesbury.

Sutton (SURREY).—Houses (140); U.D.C. surveyor.

Sutton Coldfield.—Houses (250), Rectory Estate, New Oscott; estate company.

Tamworth (STAFFS).—Houses (132), Amington Road; borough surveyor.

Thornaby-on-Tees.—Houses (120); borough engineer.

Tipton (STAFFS).—Houses (70), Upper Church Lane site; U.D.C. surveyor.

Tunbridge Wells.—Houses (56); borough surveyor.

Wakefield.—Catholic Church for Canon Leteux, Dewsbury Road; Hilton & Fox. Houses (56), Charles Avenue; C. F. Napper.

Walsall.—Premises, Bentley Lane (£3,000); Holt Brewery Co., Ltd.

Warminster (WILTS).—Cabinet and furniture works, Station Road; H. E. Nicholls.

Warrington.—School, Knutsford Street. Factory reconstruction, Norman Street; Alliance Box Co., Ltd. Houses (98), Princess Avenue, and Latchford Estate (33); borough engineer.

West Bromwich.—Church, Friar Park Estate; Lichfield Diocesan Trust.

Weymouth.—Building estate, Faircross; Smith & Lander.

West Sussex.—Schools, St. James' and Lancastrian sites, and extensions, High Schools for Boys and Girls, Chichester; county architect, Chichester.

Wickham Market.—School (£12,500); East Suffolk E.C.

Worksop.—Central premises, Eastgate, for Worksop Co-operative Society, Ltd.; J. Haslam & Sons, architects, Ryton Chambers.

Worthing.—Houses (54), Broomfield Avenue; A. T. W. Goldsmith. Baths, Beech House land (£45,000); borough engineer.

York.—Hotel, Burton Stone Lane; J. Smith's Brewery Co. Building estate, North Lane, Dringhouses; W. Simpson. Hotel, Crichton Avenue; J. J. Hunt, Ltd. Houses (40), Burnholme Estate; J. N. Dunn.